US Army Corps of Engineers
Buffalo District

Cayuga Creek, Niagara County, New York

Flooding and Related Water Resources

Section 905(b) (WRDA 86) Analysis
Reconnaissance Report

March 2002

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1.0 STUDY AUTHORITY

The Cayuga Creek 905(b) Reconnaissance Study was conducted per Section 434 of the Water Resources Development Act of 1999. The study was initiated through the office of Congressional Representative John J. LaFalce, 29th Congressional District, New York State. Funds were made available in the Omnibus Consolidated Appropriations Act of 2001, which states:

"*..$100,000 shall be available for a reconnaissance study of flooding, drainage, and other related problems in the Cayuga Creek watershed, New York;..*"

The inclusion of the term "watershed" to the study authorization is interpreted to provide the authority to evaluate other water resources related problems and needs within the Cayuga Creek basin.

2.0 STUDY PURPOSE

The purpose of this study is to determine if there is a Federal interest in developing a plan for flood damage reduction in the Town of Niagara in the vicinity of the Cayuga Village Trailer Park. This analysis will provide the initial opportunity for other agencies and groups to evaluate their interest in participating in detailed studies in the feasibility phase.

3.0 LOCATION OF STUDY AREA/CONGRESSIONAL DISTRICTS

3.1 Location of Study Area

Cayuga Creek is a tributary to the Niagara River and lies within the Erie-Niagara drainage basin of western New York State in Niagara County, New York (Figure 1). The headwaters of the 10-mile long Cayuga Creek main-stem originates off of the Niagara Escarpment in the Town of Lewiston near the hamlet of Pekin. From this point the creek flows southward through the Tuscarora Nation and Town of Wheatfield. The creek crosses under Walmore Road onto the Niagara Falls International Airport-Air Force Base complex and continues southward through the Town of Niagara, and the City of Niagara Falls where it joins its major tributary Bergholtz Creek before continuing south to join the Little River opposite Cayuga Island.

3.2 Watershed Municipalities

The 34± square mile Cayuga Creek basin includes six municipalities and the Tuscarora Nation (Figure 2). Five of the communities listed below containing segments of the "main-stem" (channel) of Cayuga Creek. (* = Main-stem community)

Municipality	County	U.S. Congressional District
City of Niagara Falls*	Niagara	29th
Town of Niagara*	Niagara	29th
Town of Wheatfield*	Niagara	29th
Town of Lewiston*	Niagara	29th
Tuscarora Nation*	Niagara	29th
Town of Cambria	Niagara	29th
City of North Tonawanda	Niagara	29th

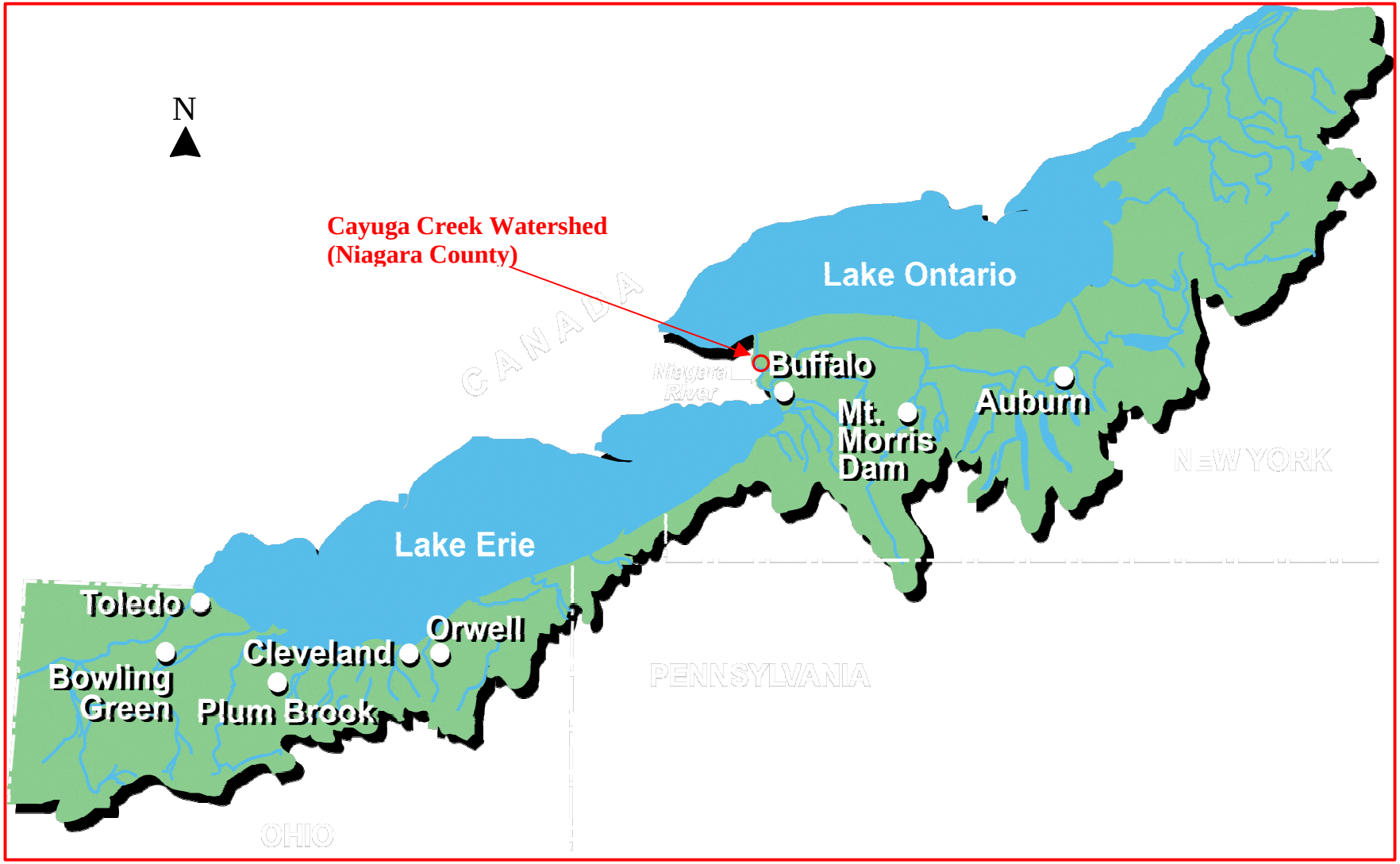


Figure 1: Buffalo District Boundary and Study Location.

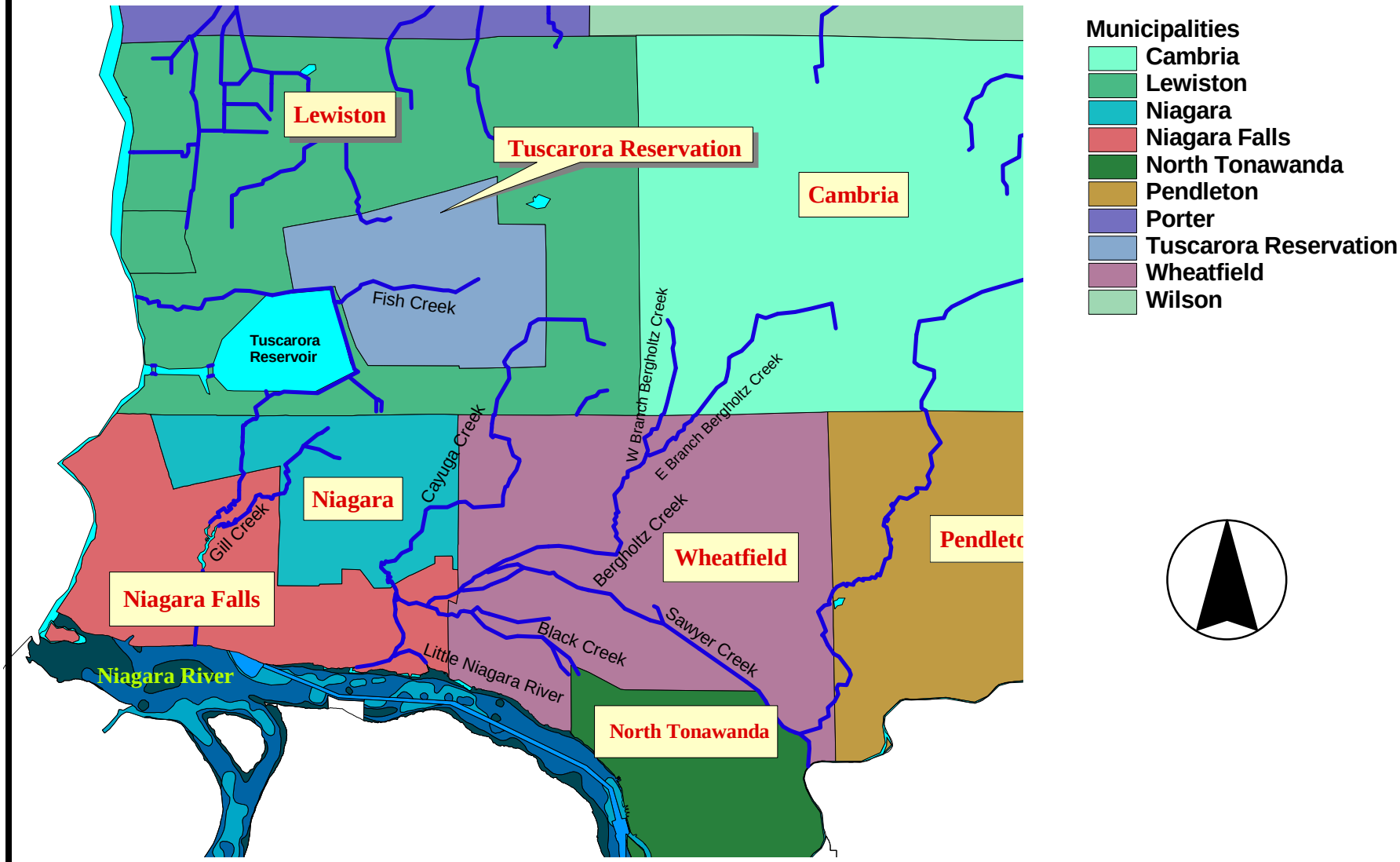


Figure 2: Cayuga Creek Watershed Municipal Boundaries.

3.3 U.S. Congressional Districts

The study area lies within the 29th U.S. Congressional Districts in New York State represented by John J. LaFalce. Figure 3 shows the location of the study area in relationship to the U.S. Congressional Districts.

4.0 PRIOR STUDIES, REPORTS AND EXISTING WATER PROJECTS

4.1 Prior Studies and Reports

4.1.1 Corps of Engineers

As a result of floods prior to 1962, Congress authorized the Buffalo District to investigate the causes and develop solutions to flooding on Cayuga Island associated with the Little River near the mouth of Cayuga Creek in the City of Niagara Falls (Figure 4). A Draft Survey Report dated 1964 was prepared initially. It was followed by a Detailed Project Report dated 1966, in which a flood control project was considered favorable and was recommended and approved for construction. Engineering design was completed in 1968; however, initiation of construction was postponed due to delays in the acquisition of easement real estate by the State of New York.

Photo. Exhibit 1: Northeast facing view of the mouth of Cayuga Creek (shown at left) at the Little River in the City of Niagara Falls from the S. 86th Street bridge (February 2002).

During this interim, evidence mounted that the ice boom at the head of the Niagara River was having a significant effect in reducing ice-jam flooding on Cayuga Island. The economics of the project were reevaluated and it was found that there were insufficient damage-reduction benefits to justify the cost of construction. Deauthorization of the Cayuga Island flood control project was approved by the Office of the Chief of Engineers on 30 August 1971. It was suggested to local non-Federal interests that it would be their responsibility to undertake appropriate non-structural or structural flood control measures.

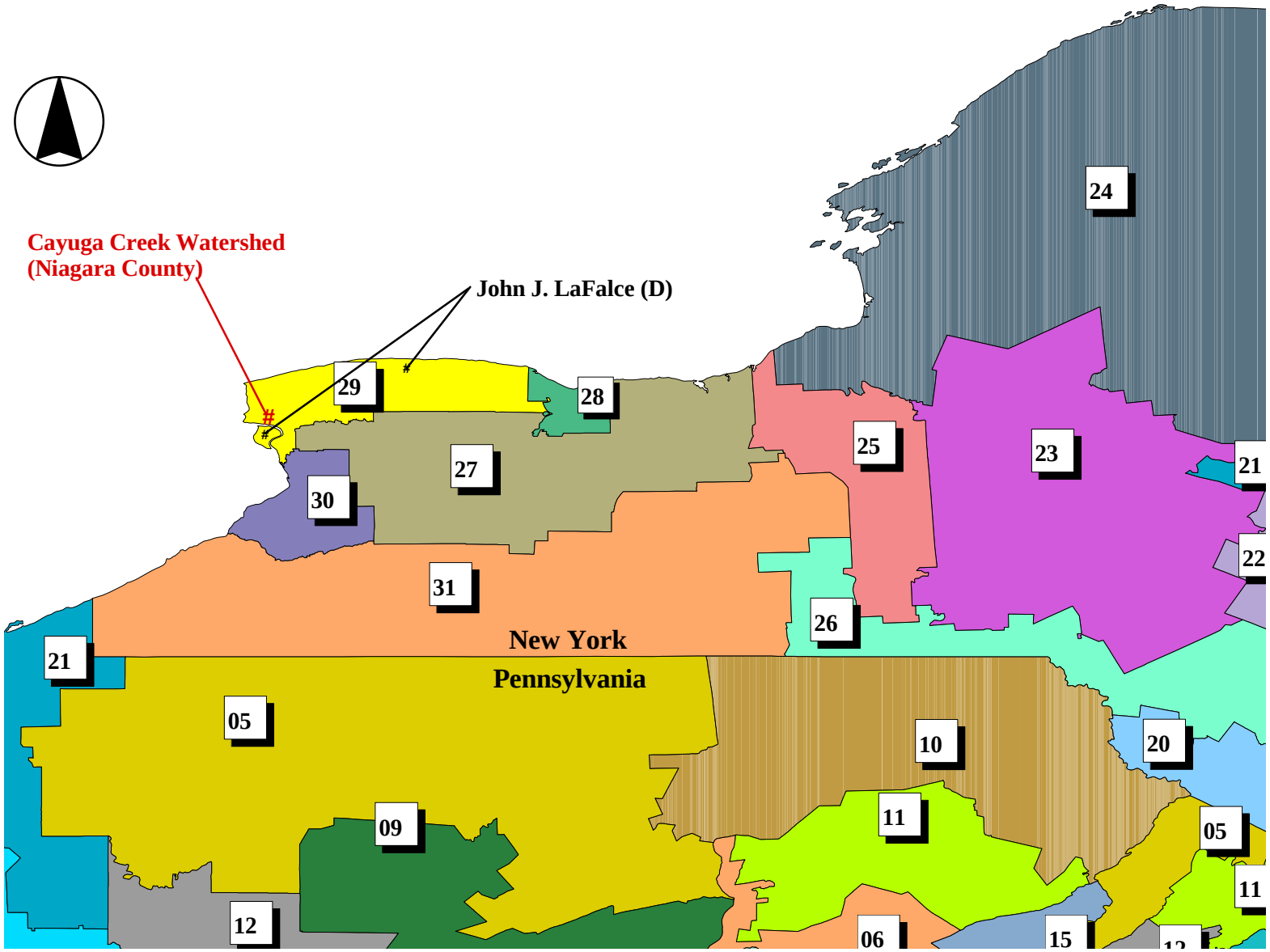


Figure 3: U.S. Congressional Districts.

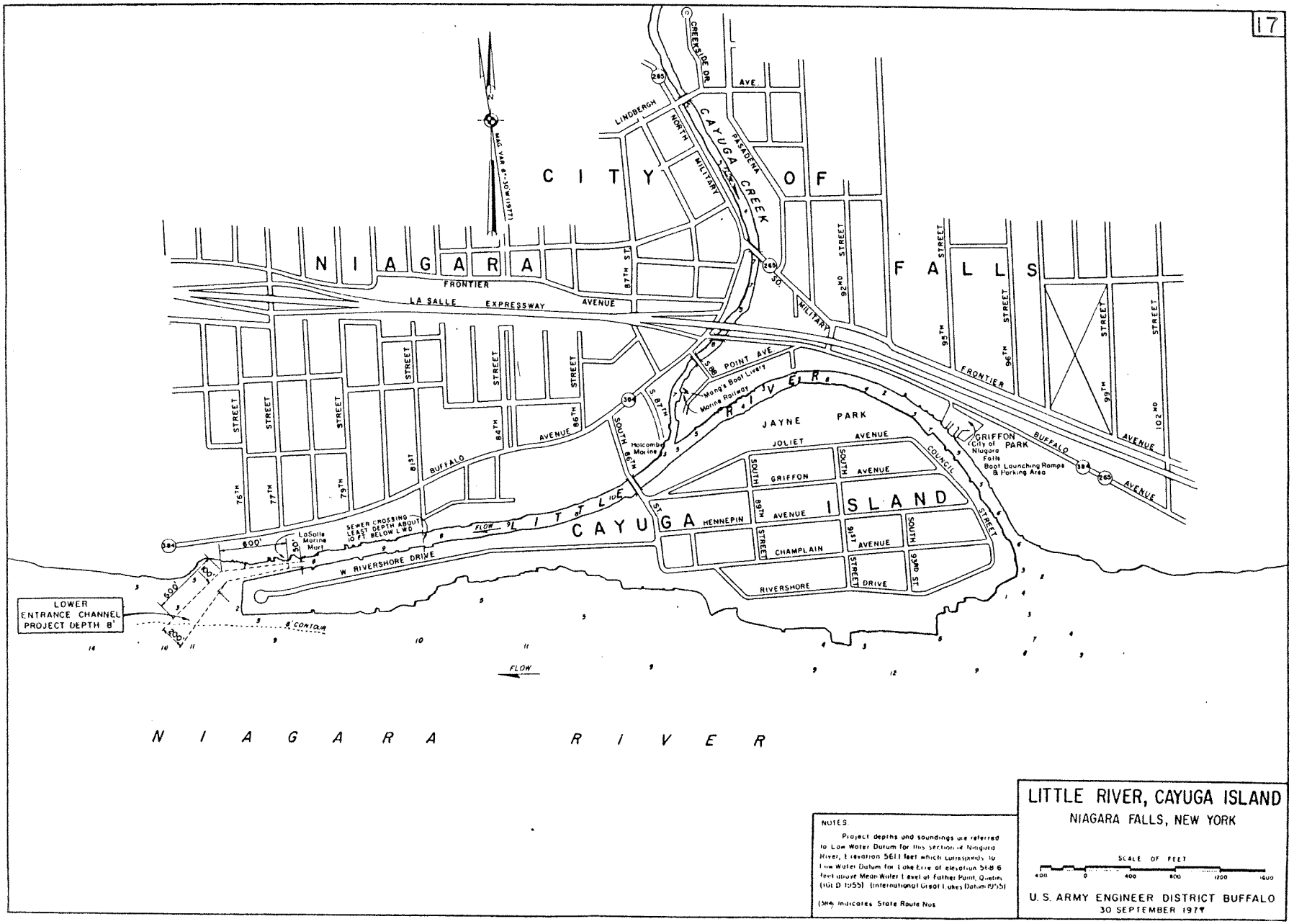


Figure 4: Location of Cayuga Island Flood Damage Reduction Study (1979 Detailed Project Report).

Due to the reoccurrence of flooding on Cayuga Island in 1972 and 1975, and subsequent regulatory changes made on the Niagara River in the vicinity of the grass island pool, the study was reactivated. A Reconnaissance Report was completed in June 1975. The report investigated the applicability of the findings of the prior Detailed Project Report, completed in 1966, upon new findings about flood-reducing effectiveness of the ice boom, and regulation of the grass island pool.

A Detailed Project Report was prepared in 1979 entitled "*Draft Detailed Project Report for Flood Damage Reduction on Little River and Cayuga Creek at and in the Vicinity of Cayuga Island, Niagara County, New York"*. This report further examined the flood damage reduction measures proposed in the Reconnaissance Report dated June 1975. The alternatives were based upon those plans proposed in the earlier Detailed Project Report Dated 1966 that was deauthorized in 1971. No Federal project was ever built as a result of these studies and the U.S. Army Corps of Engineers has had no further involvement in this regard.

(1) Floodplain Remapping Study: Bergholtz Creek, City of Niagara Falls, New York (1998).

In February 1998 representatives of the City of Niagara Falls contacted the U.S. Army Corps of Engineers, Buffalo District requesting assistance in updating their flood insurance maps, specifically in the area of Bergholtz Creek. The City of Niagara Falls had recently invested in new topographic mapping which contained much greater detail than the base maps used for the existing flood insurance maps produced by the Federal Emergency Management Agency (FEMA) dated September 1990. The City of Niagara Falls believed that if the existing data were overlaid on the new topographic mapping; the result would allow them to better administer their floodplain program. Their investigations lead them to believe that the FEMA maps incorrectly showed many structures in the floodplain presumably due to the lack of detail in the base mapping. In addition there was a discrepancy between the 100-year flood elevations computed for the City of Niagara Falls and those of the upstream community, the Town of Wheatfield.

The Buffalo District reviewed its data for Bergholtz Creek and found that the stream was restudied in 1990 under FEMA's Limited Map Maintenance Program (LMMP) for the Town of Wheatfield. At that time, the hydrologic analysis for Bergholtz Creek was revised. To ensure consistency between the City of Niagara Falls and the Town of Wheatfield studies, the Buffalo District modeled all of Bergholtz Creek using the revised flows. The revised model was submitted to FEMA with a recommendation that the City of Niagara Falls study be updated to reflect the new hydrology. FEMA produced an updated Flood Insurance Study for the Town of Wheatfield but did not update the City of Niagara Falls Study.

The Buffalo District consulted with the New York State Department of Environmental Conservation and the City of Niagara Falls and agreed that replotting the 100-year floodplain on the City of Niagara Fall's new mapping using the revised hydrology would best reflect the conditions existing in the Bergholtz Creek floodplain.

(2) Summary of Hydrology Recalculation: Niagara Falls Air Reserve Station, Niagara County, New York. (1999).

The Niagara Falls Air Reserve Station (Air Force Base) asked the Buffalo District to determine whether or not the Air Force Base contributes to downstream flooding on Cayuga Creek. Consequently, this rainfall runoff model HEC-HMS (Hydrologic Modeling System) was used to determine the creek flows for a 1% chance (100-year) rainfall event. Separate models were constructed to represent the current conditions ("developed") and conditions that assume that the Air

Force Base was never built and that nothing was built in its place ("undeveloped"). The calculated flows for the developed and undeveloped conditions at Porter Road were 2,390 and 2,380 cfs respectively. This 10 cfs increase in flows constituted a 0.4% change which was determined to have little impact on downstream flooding.

The HEC-HMS model used a temporal rainfall distribution that delivered a large percentage of the rainfall in a relatively short period of time, resulting in large flows. The appropriateness of this distribution for the western Niagara County region was called into question during the completion of the Flood Insurance Study of Gill Creek. The temporal distributions of area storms were examined and it was determined that the Second Quartile distribution form Bulletin 71 *Rainfall Frequency Atlas of the Midwest* was an appropriate curve for the area. Thirty six-hour rainfall estimates were applied to this distribution for the determination of the HMS hydrograph.

Hydrology was recalculated using this rainfall distribution for both the "developed" and "undeveloped" conditions. The peak flows for the 1% chance (100-year) event were 1,500 (developed) and 1,495 (undeveloped) cfs. The calculated effect of the Air Force base on the 1% peak flows was on the order of 5 cfs or about 0.3%. This will have little impact on downstream flooding.

4.1.1.a Other Federal Studies

Through the Department of the Interior the U.S. Fish and Wildlife Service received approximately $300,000 as part of a settlement with the Occidental Chemical Corporation for restoration of natural resources damaged by toxic dumping. In 1997 it was the expressed intent of the U.S. Fish and Wildlife Service to use these funds for development of a restoration plan for water and related natural resources on Cayuga Creek. The U.S. Fish and Wildlife Service is seeking to complete a restoration plan in 2002.

4.1.2 State, Regional, County, and Local Studies and Reports

4.1.2.a New York State

The State of New York has no existing or ongoing water projects on Cayuga Creek. However, the New York State Department of Environmental Conservation Division of Water, Division of Fish & Wildlife, and Division of Hazardous Waste monitor and administer a diversity of activities within the watershed. By law the State of New York through the New York State Department of Environmental Conservation, serves as the non-Federal sponsor for cost-shared flood control studies and projects.

4.1.2.b Regional

In 1963 the Erie-Niagara Counties Regional Planning Board (ENCRPB) was established to prepare a comprehensive plan for the development and management of the water and related land resources of the Erie-Niagara basin. In 1975 the ENRPB published the "*Cayuga Creek Water Quality Study*" setting forth watershed development/pollution abatement programs, considered enhancement measures, alternative plans of action and plan implementation.

During the period 1977-81 ENCRPB also included Cayuga Creek in the "*208 Water Quality Reports*" for land use, environment, and water pollutant loadings based upon typical land use and water quality parameters. There are no other known regional projects or studies for the Cayuga Creek basin.

4.1.2.c Niagara County

In February 1997 the Niagara County Legislature passes a resolution establishing the *"Niagara County Cayuga Creek Management Study Committee"*. The Niagara County Cayuga Creek Management Study Committee (Committee) was formed to coordinate the efforts of watershed communities and county, state, and Federal agencies and organizations to address drainage related the problems and needs in the watershed. Problems and needs identified in the resolution include poor drainage due to improper creek and infrastructure maintenance and design and lack of coordination among local, and in some cases, county jurisdictions. The Committee was viewed as an appropriate opportunity to coordinate all of the various aspects associated with correcting drainage with Cayuga Creek. The Committee was directed to prepare recommendations for a proposed "Creek Management Study" and a set of administrative guidelines for the coordination and management of drainage in Cayuga Creek. The efforts of the Committee were reported through the Public Works Committee of the Niagara County Legislature.

In August 1997 the Niagara County Department of Planning, Development & Tourism, in cooperation with the City of Niagara Falls and the Cayuga Creek Management Committee, published the research report *"Cayuga Creek Management Study"*. The study area was Cayuga Creek from its mouth on the Little River north to the Niagara Falls City line, as well as riparian properties along this portion of the creek. The report is a compilation of information intended to assist in the development of a program to improve conditions currently associated with Cayuga Creek. The report is organized into sections each describing the progress made in the following areas highlighted by the Niagara County Cayuga Creek Management Committee.

Study Area – Scope of Work
Property Inventory Map
Water Flow and Direction
Flood Zones
Water and Sediment Sampling
Hyde Park/Gill Creek Restoration – Funding History
Funding Alternatives
Regulatory/Jurisdictional Responsibilities

The report sets forth the Niagara County Department of Planning, Development & Tourism's suggestion that the City of Niagara Falls address tree and debris removal along both banks of Cayuga Creek from south Military Road north to the Niagara Falls City line as the initial step to be undertaken in addressing the management of Cayuga Creek. Niagara County Department of Planning, Development & Tourism also suggests that the City enter into cooperative agreements with the riparian property owners to accomplish this clean-up and obtain easements along Cayuga Creek to perpetuate maintenance and management.

4.1.2.d Local

As required by state law, all municipalities in New York State participate in the National Flood Insurance Program (NFIP). As part of their participation in the NFIP they have to adopt certain floodplain ordinances into their local laws. All the communities along Cayuga Creek, outside of the Tuscarora Nation, have floodplain regulations.

4.2 Existing Water Projects

There are no existing Federal water projects on Cayuga Creek or its tributaries. Existing flood control facilities consist of a private earthen berm built along Cayuga Creek to control flood waters and protect structures in and around the Cayuga Village Trailer Park in the Town of Niagara.

The Town of Wheatfield has had a very active and successful drainage program since the mid-1990's led by the Town Drainage Committee and the Highway Superintendent. The Town Highway Department has been in the process of systematically clearing and snagging all the main drainageways in the Town of Wheatfield, including their tributaries. Main drainagways that have been cleared to date include Bergholtz Creek, Sawyer Creek, portions of Black Creek, portions of Bull Creek, and Cayuga Creek. The Town of Wheatfield performs annual maintenance review of previously cleared waterways and ensures continues unrestricted drainage flow through these areas.

To address flooding at Walmore Road after major storms or snow-melt events Cayuga Creek was cleared during the later part of 2001. Although the Town of Wheatfield is not aware of any significant property damage associated with this drainage problem , there is a traffic safety concern when the road becomes flooded. It was believed that this flooding was caused by Cayuga Creek having significant blockages in many areas as it meandered through the town. The Town of Wheatfield hopes that clearing and maintaining the creek will reduce or eliminate this problem.

5.0 PLAN FORMULATION

5.1 Existing Conditions

5.1.1 Flooding

Flooding to the Cayuga Village Trailer Park in January and March of 1998 was the motivating factor for the authorization of this Section 905(b) Reconnaissance Study. Accordingly, study and analysis was undertaken on Cayuga Creek in the focus area between Porter Road and Niagara Falls Boulevard encompassing the Cayuga Creek Trailer Park and vicinity (Figure 5). The study included an analysis of hydrologic and hydraulic conditions using prior hydrologic and hydraulic modeling results and existing data and information. The results of these analyses were used to identify the factors believed to contribute to flooding in the study area, to support a preliminary survey of damages and formulation of alternative plans.

There are no climatological stations located within the Cayuga Creek watershed. There is one first-order weather station located at the Buffalo-Niagara International Airport approximately 16 miles southeast of the watershed. For the Buffalo Weather Service station at the Buffalo-Niagara International Airport, the average annual precipitation is 36.19 inches. The maximum monthly average is 3.28 inches in December. The average annul snowfall as recorded at the Buffalo Weather Service station is 91.1 inches. The highest average monthly snowfall is 24.2 inches in January. The average temperature at the Buffalo Weather Service station is 47.4 degrees F. July is the warmest month and February the coldest, with average monthly temperatures of 70.5 and 24.8, respectively.

Cayuga Creek has its headwaters in the Town of Lewiston and the main-stem flows southward through the Towns of Wheatfield and Niagara, the City of Niagara Falls and a portion of the Tuscarora Nation. A series of tributaries, including Bergholtz Creek, Sawyer Creek and Black Creek, flow into Cayuga Creek from the east. Cayuga Creek rises in the southeast lowland area of

Figure 5: Cayuga Creek Reconnaissance Study Focus Area (Town of Niagara).

Photo. Exhibit 2: Culverted crossing of Cayuga Creek under Walmore Road north of Lockport Road in the Town of Wheatfield (February 2002).

the Tuscarora Nation north of Saunders Settlement Road, and flows in a southerly direction. Between Saunders Settlement Road and the first Walmore Road bridge the creek channel is often choked with grasses and aquatic plants. In this reach, sediment and debris deposits occur at many of the crossings causing constrictions. Dense growths of small trees and bushes border the creek and numerous flow blockages occur chiefly due to fallen trees and accumulations of woody and other debris.

From the above mentioned Walmore Road bridge, Cayuga Creek flows generally south to where it turns west as it enters the Niagara Falls International Airport-Air Force Base complex (see Photo. Exhibit 3). Crossing the airport-air base complex, the creek flows through a manmade diversion channel bordering the southern perimeter of the Niagara Falls Air Force Base. This channel, excavated in 1944 to allow runway construction, is characterized by steep rocky slopes, mucky sediment deposits, and scattered vegetation. After crossing under the main runway, Cayuga Creek flows south through a shallow ditch-like channel with muddy banks and bottom.

Leaving the airport-air base complex, Cayuga Creek flows south to Porter Road where the creek here is shallow, running over sections of exposed bedrock. The banks support heavy plant growth, with overhanging vegetation often forming a low canopy over the creek.

From Porter Road southward the creek enters urbanized landscape and there is a noticeable change in character. A 2,000-foot stretch immediately downstream of Porter Road in the immediate vicinity of the Cayuga Village Trailer Park has been channelized to reduce overbank flooding. Downstream of this section, the creek follows a meandering course roughly paralleling Tuscarora Road. The east bank is heavily wooded and the west bank is partially cleared by property holders along the creek. In this reach, the creek channel is strewn with refuse and woody debris.

Approximately 1,000 feet above Niagara Falls Boulevard, the upper limit of the Niagara River backwater is encountered. South of Niagara Falls Boulevard the creek begins to broaden and velocities drop due to backwater effects of the Niagara River. At the confluence with Bergholtz

Creek the creek becomes wide and sluggish, with thick sediment deposits along its bed. The downstream reach from Niagara Falls Boulevard to the confluence with the Little River is

Photo. Exhibit 3: Southwest facing view of Cayuga Creek flowing onto the airport-air base complex under Walmore Road bridge and railroad bridge in the Town of Wheatfield (February 2002).

strewn with partially submerged shopping carts, tires, fallen tree limbs, and other debris that represent obstructions to flow and recreational navigation.

Photo. Exhibit 4: South facing view of Cayuga Creek immediately south of the Porter Road bridge (September 2001).

Photo. Exhibit 5: View of typical Cayuga Creek channel conditions in the Town of Niagara along the "farmer's field" in the study focus area just south of Porter Road (September 2001).

Photo. Exhibit 6: Northwest facing view of meandering segment of Cayuga Creek along Tuscarora Road south and west of the Cayuga Village Trailer Park and north of Niagara Falls Boulevard in the Town of Niagara. Note residential development along the west bank (February 2002).

Photo. Exhibit 7: West facing view of Cayuga Creek confluence with Bergholtz Creek immediately south of the Cayuga Drive bridge in the City of Niagara Falls (February 2002).

Gradients average about 8.6 feet per mile. The stream reach from Saunders Settlement Road to the Walmore Road bridge, where the creek enters the airport-air base complex, has an average gradient of 11.8 feet per mile. The grade averages about 8.1 feet per mile from the Walmore Road bridge to the Niagara Falls Boulevard bridge and the remaining downstream section of Cayuga Creek to the mouth has an average gradient of 3.8 feet per mile. Daily fluctuations in the water level of Cayuga Creek are primarily caused by the drawdown of the Niagara River by the Power Authority of the State of New York (PASNY).

5.1.1.a Summary of 1998 Flood Events

There was recurring flooding on Cayuga Creek in the vicinity of the Cayuga Village Trailer Park in the Town of Niagara in January and March of 1998. The January flood event was far more severe and resulted in the evacuation of approximately 800 people from their homes. The March event caused concern amongst the homeowners, but evacuation was not warranted. During these flood events, the U.S. Army Corps of Engineers, Buffalo District dispatched field teams on two separate occasions (January 9, 1998 and March 26-27 1998).

Melting snow, coincident with moderate amounts of precipitation is the characteristic cause of floods in the region and on Cayuga Creek. Although flood events can occur at all times of the year, almost all damaging floods in the region have occurred in the late winter or early spring (January - April). Relatively few damaging floods have been produced by precipitation alone.

The flood of January 1998 was caused by excess precipitation that also affected other watersheds in the region. Rainfall measured at the Buffalo-Niagara International Airport weather station totaled 3.17 inches for the period January 6-9. Temperatures for the period prior to the event were above freezing with a high of 61^{o}F recorded on January 5. There was no measurable snowfall for the week preceding the event and no snow on the ground. There are no gauging stations on Cayuga Creek and

consequently no discharge records or flood stage data is available for the January or the March 1998 event.

The only recorded damaging floods during this period were in the Cayuga Village Trailer Park area. For this study the Town of Niagara provided documentation indicating 63 Notices of Claim were filed for property damages in the Cayuga Village Trailer Park as a result of the 1998 events. These claims totaled approximately $405,000 and are the only available records of flooding related losses on Cayuga Creek.

The severity of the January event and the resultant evacuations caused the Buffalo District field team to focus its attention on the Cayuga Village Trailer Park itself. The ponding of water within the park, the debris that was disbursed within the park, and the concentration of debris at the park's perimeter, gave the indication that the swell of water was internal to the park and receded to the parks storm sewer system. Based on these observations the field team concluded that the flooding problem was one of internal drainage and a restricted storm sewer network in the immediate area.

The flood event in March, although not as severe as the January event, gave the field team an opportunity to re-examine the affected area. The investigation after the March event provided a clearer picture of the likely true causes of the flooding problem.

There is an existing old earthen levee (berm) that defines the east and south banks of Cayuga Creek as it flows through the area immediately north of the trailer park (Figure 6). This structure is suspected to be the remains of an old levee that was constructed to protect open space east of the levee referred to as the old "farmer's field". This levee, as it currently exists, is approximately 300 feet short of connecting with the elevated roadway known as Porter Road (Route 182) and, therefore, fails to maintain a continuous level of containment. The old farmer's field is approximately 30-36 acres in size and has functioned in the past as a retention basin to reduce the severity of flooding. Time and development in the surrounding landscape, however, has reduced the farmer field's effectiveness for flood water storage.

Three 18-inch diameter drainage culverts underneath Porter Road adjacent to the northern boundary of the farmer's field convey drainage under and along Porter Road into the farmer's field. The farmer's field also receives water from the overflow from Cayuga Creek, snowmelt, and precipitation. When the flow of water in the Cayuga Creek raises to the point were it can flow out of bank near the Porter Road bridge, the storage capacity of the farmer's field has already been reduced by snowmelt, precipitation and drainage from the north under Porter Road. The farmer's field outlets to a single 15 inch diameter culvert that flows into the trailer park's storm sewer system and a single 36 inch diameter culvert that flows into the City of Niagara Falls' storm sewer system underneath Niagara Falls Boulevard (Route 62). By the time the 36-inch culvert starts draining water from the farmer's field there is already 3 feet of head on the 15-inch culvert that flows into the trailer park's storm sewer system. This overwhelms the trailer park's storm sewer system and the flooding problem manifests itself as internal flooding. Also, the flow capacity of Cayuga Creek has been reduced by extensive vegetative and tree growth within its banks and by a less than optimum channel alignment.

As a result of the 1998 flood events, the field team installed a temporary geotextile tube to repair a breach in the earthen berm and concluded that the solution to this problem is not straight-forward. Specifically, further watershed analysis was recommended since any improvements that are limited to this immediate area will undoubtedly have an impact upon downstream communities.

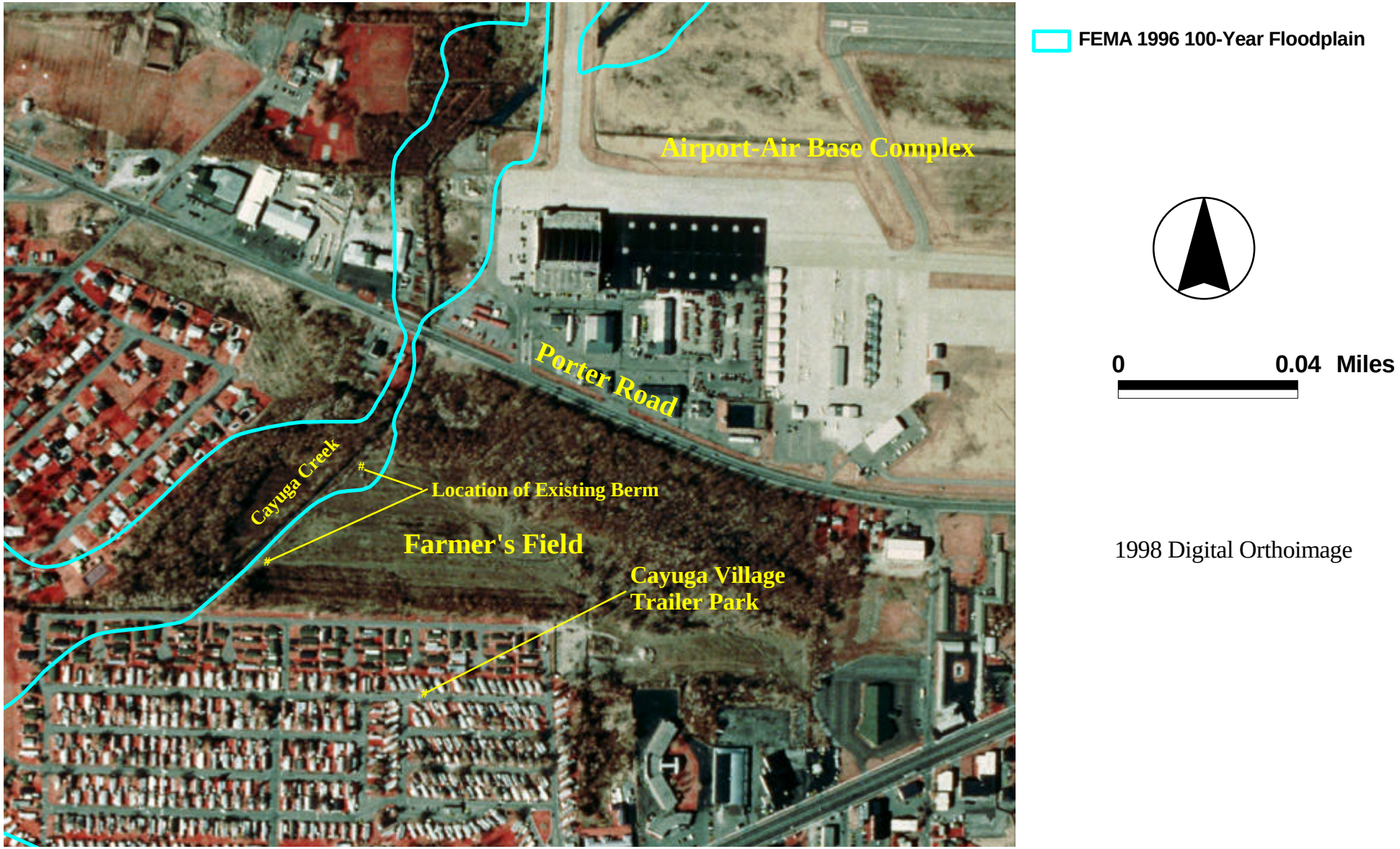


Figure 6: Existing Berm (Levee) at Farmer's Field in Study Focus Area.

5.1.1.b Current Hydrologic Analysis

A Cayuga Creek watershed model to Porter Road was developed in 1999 to determine whether or not the Niagara Falls Air Reserve Station contributed to downstream flooding on Cayuga Creek. The watershed characteristics were developed using USGS Quadrangles; a draft publication dated May 1997: "Integrated Natural Resources Management Plan, Niagara Falls Air Reserve Station, NY," the Environmental Division, Headquarters, Air Force Reserve Command, Robins Air Force Base, Georgia; and the NRCS Soil Survey of Niagara County, NY, issued October 1972. The land use was determined from the USGS Quadrangle maps and field survey of the watershed. The air base was divided into six sub-basins. The drainage areas and percent impervious values were taken from the May 1997 draft publication listed above. The soil types for the watershed's sub-basins were determined using the NRCS publication listed above.

This 1999 study concluded that the air base had very little impact on the peak discharges for Cayuga Creek. This report stated: "The runoff model estimates that there is about a 10 cfs (0.4%) increase in the 100-year peak discharge in Cayuga Creek due to the air base." The temporal rainfall distribution in this model was updated in May 2001 to better represent the rainfall patterns in Niagara County. The results from this change showed a 5 cfs (0.3%) increase in the 100-year peak discharge in Cayuga Creek due to the air base.

The hydrologic model for the Cayuga Creek Section 905(b) Reconnaissance Study used the above 1999 watershed model and an additional drainage area shown in Plate 1, which incorporated the Cayuga Creek watershed to the confluence with Bergholtz Creek. This additional drainage area included the "West Branch Tributary" basin, drainage areas between Niagara Falls Boulevard and Porter Road, and a small portion downstream of Niagara Falls Boulevard to the confluence with Bergholtz Creek. The West Branch Tributary basin is shown on Figure 7 as the combined green and yellow hatched areas. The methods for obtaining the additional parameters for these sub-basins were the same as what was described above for the Air Force Base modeling (i.e. USGS Quadrangles, etc.).

Discharge-frequency curves were calculated for ten reaches on Cayuga Creek. Cayuga Creek runs through Niagara County and ends at the confluence with the Little River. The hydrologic analysis ended at the confluence with Bergholtz Creek, approximately 1.1 miles upstream from the Little River. The peak discharges were calculated using the Hydrologic Engineering Center's computer program, Hydrologic Modeling System (HEC-HMS), Version 2.1.2, dated June 2001. The watershed was divided into 13 sub-basins. A schematic of the watershed model is shown in Plate 2.

Rainfall amounts for the 50% (2-year), 20% (5-year), 10% (10-year), 4% (25-year), 2% (50-year), and 1% (100-year) events were derived from the Northeast Regional Climate Center's publication RR 93-5 "Atlas of Precipitation Extremes for the Northeastern United States and Southeastern Canada" by Daniel S. Wilks and Richard P. Cember, September 1993. The 0.5% (200-year) and 0.2% (500-year) events were extrapolated from the derived rainfall amounts.

Rainfall distribution curves from Bulletin 71 "Rainfall Frequency Atlas of the Midwest" by Floyd A. Huff and James R. Angel, 1992, were used to create cumulative precipitation gages with a total rainfall amount of 1 inch. The type of curve and the duration of the event were determined from

Scale

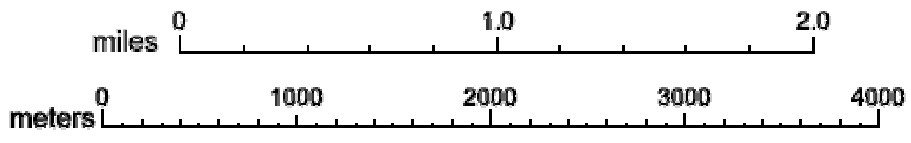
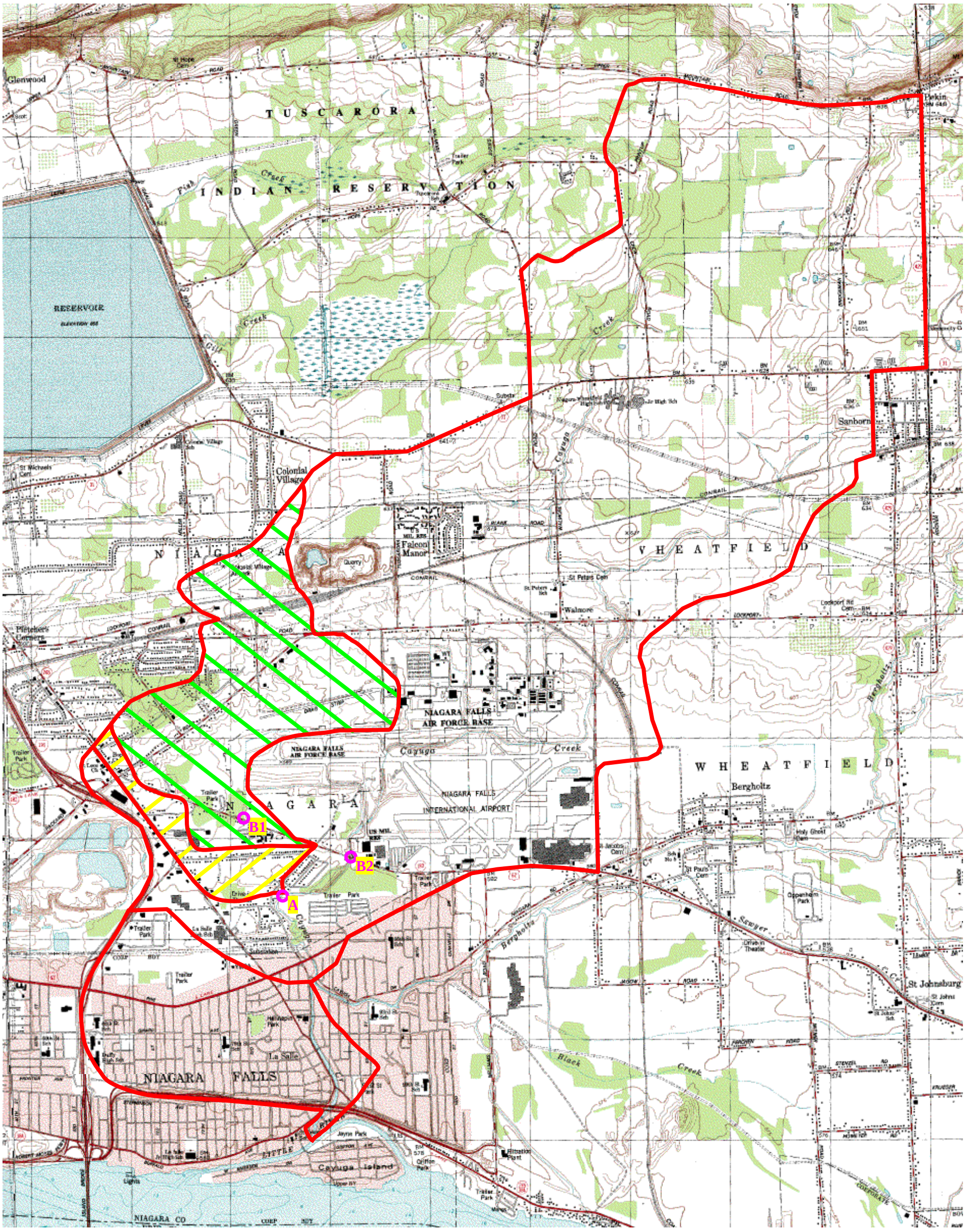


Plate 1 : Cayuga Creek Watershed Boundary.



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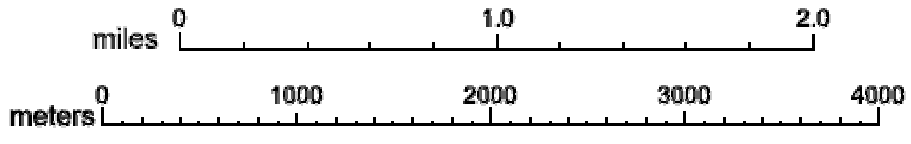

Figure 7: West Branch Tributary Basin.

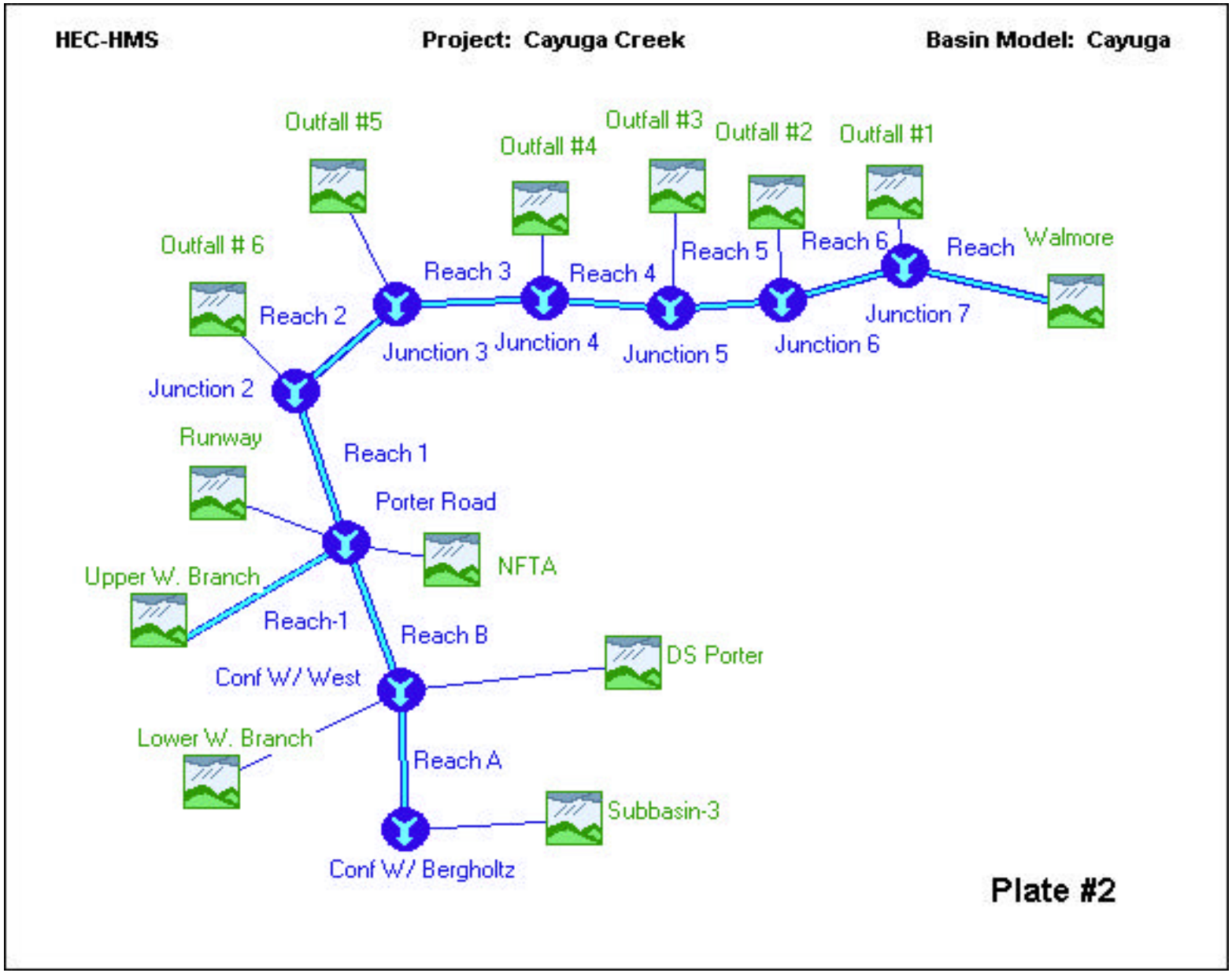

Plate 2: HEC-HMS Model Basin Reaches.

observing four data sets that were used for Gill Creek in the City of Niagara. A pattern seemed to form where more frequent events (5 and 10-year) used the fourth quartile distribution with a 6-hour duration. The 25-year and 50-year events used the second and first quartile distribution, respectively, with a 6-hour duration. The 100-year event used the first quartile distribution and had a 24-hour duration. The 200 and 500-year events also used the first quartile distribution, but seemed to have a duration that exceeded 24-hours. The peak discharges from HEC-HMS for the 5, 10, 25, 50, and 100-year events were plotted on a Discharge-Frequency curve and a "best-fit" line was drawn in order to determine the discharges for the 2-year, 200-year, and 500-year events which did not fall within a typical duration. A summary of the discharges is shown in Table #1.

Runoff from the sub-basins was calculated by SCS Dimensionless Unit Hydrograph method. The SCS curve number method was used to determine rainfall losses. The Muskingum Cunge 8 Point method and Lag time were used to route hydrographs from point to point. The SCS Dimensionless Unit Hydrograph parameters and SCS curve numbers were calculated using guidelines of TR-55 "Urban Hydrology for Small Watersheds," Soil Conservation Service, June 1986. The Muskingum Cunge 8 Point method and Lag time were developed from information provided by survey data and USGS Quad maps.

Table 1: Summary of Frequency Discharges for Cayuga Creek.

Event	Discharge	
	At the confluence with the West Branch Tributary (cfs)	At Porter Road (cfs)
2-year	500	470
5-year	860	780
10-year	1110	1010
25-year	1450	1360
50-year	1700	1590
100-year	1990	1910
200-year	2360	2200
500-year	2820	2640

The 1965 Tonawanda West and Ransomville USGS Quadrangles show the West Branch Tributary basin as originally being 2.15 square miles and discharging into Cayuga Creek via an open channel just south of Lozina Drive (location A on Figure 7). Presently, a 1.79 sq. mile portion of the West Branch Tributary basin is diverted through a culvert beginning at Porter Road (location B1 on Figure 7), which then discharges into Cayuga Creek at Porter Road (location B2 on Figure 7), approximately 2800' further upstream than its original location. There has also been some development in the basin along Packard Road and Porter Road that could lead to higher discharges.

Photo. Exhibit 8: The West Branch Tributary discharge pipe shown facing west northwest immediately south of the Porter Road bridge in the Town of Niagara (September 2001).

The current hydrologic model has a 10-yr. discharge of 1010 cfs at the West Branch Tributary outfall on Cayuga Creek (location B2 on Figure 7). If the West Branch Tributary were not a contributing factor at Porter Road, the discharge for the 10-yr. event at location B2 would be around 730 cfs, which represents a 280 cfs difference in discharge. The remaining 0.37 square mile West Branch Tributary basin (highlighted in yellow) has been developed quite extensively within the past 20+ years and the once open channel is now routed through a culvert and discharges into Cayuga Creek at location A.

Consequently, based upon the results from the 1999 Niagara Falls Air Reserve Station report, and the hydrologic findings from this study, the redirected flow from the West Branch Tributary would have a much greater impact on increasing discharges between Porter Road and Niagara Falls Boulevard than the Niagara Falls Air Reserve Station.

5.1.1.c Current Hydraulic Analysis

A Flood Insurance Study (FIS) was done on Cayuga Creek for the City of Niagara Falls in September of 1982 and revised in September of 1990. The study limits were from the confluence with Little River to the corporate limits with the Town of Niagara. The Town of Niagara has also done a FIS on Cayuga Creek, dated December 1983. The study limits were from the corporate limits with the City of Niagara Falls to approximately 1200' upstream of Porter Road.

A hydraulic analysis was performed on Cayuga Creek in the area of interest between Porter Road and Niagara Falls Boulevard. The downstream limit of analysis is located approximately 600' downstream of Niagara Falls Boulevard at river station 5898. The upstream limit of analysis is located approximately 1155' upstream of Porter Road at river station 14157. Data for cross sections and bridges for the HEC-RAS model were obtained from the 1990 City of Niagara FIS and the 1983

Town of Niagara FIS along with updated survey performed by the Buffalo District in October 2001. A Buffalo District survey crew collected data by between Porter Road and Niagara Falls Boulevard to check the accuracy of the existing FIS cross sections and to update the existing cross sectional data where necessary. Locations of the selected cross-sections used in the hydraulic analysis are shown on Figure 8.

Peak discharge results from HEC-HMS for the 50% (2-year), 20% (5-year), 10% (10-year), 4% (25-year), 2% (50-year) and 1% (100-year), and extrapolated discharges for the 0.5% (200-year) and 0.2% (500-year) were used in the hydraulic model. Water surface elevations were computed using the Corps of Engineers HEC-RAS step-backwater computer program. A rating curve was used to determine the starting water surface elevations for Cayuga Creek.

NYSDEC records indicate Cayuga Creek was diverted from its natural channel in 1969 and sent through a man-made channel in the vicinity of the farmer's field (north of the trailer park). The results of the hydraulic model shows that the channel capacity is less than a 2-yr. event along the farmer's field reach of Cayuga Creek. The man-made channel was created with a berm on both sides that would contain the flow in a smaller cross sectional area than the natural channel, therefore producing higher velocities. The berm along the farmer's field will provide some additional protection, but this berm has breached in the past and therefore is not considered permanent. The higher velocities could have been the cause of the breach in the berm along the farmer's field that was discovered by the Buffalo District field team after the 1998 floods. This breach may have caused the farmer's field to flood. The farmer's field would then drain into the trailer park's storm water system causing the trailer park to flood. A Buffalo District field team dispatched to the Cayuga Village Trailer Park in 1998 repaired the breach with a temporary geotextile tube.

5.1.1.d Summary of Key Hydrologic and Hydraulic Findings

The combination of increased discharges due to the redirected flow of the West Branch Tributary and man's alterations to the Cayuga Creek channel have created hydrologic and hydraulic conditions that do not work efficiently during storm events. These modifications in the vicinity of the farmer's field are two possible major factors in the Cayuga Village Trailer Park flooding. Even though the flooding at the trailer park may not have occurred at the onset of these modifications, higher velocities due to these modifications could have breached the berm prompting the farmer's field to be inundated and as a result flood the trailer park. Other communities between Porter Road and Niagara Falls Boulevard will experience flooding, but typically from much higher frequency storm events than the trailer park, therefore, damages are not as severe.

5.1.1.e Flood Protection

There are presently no Federal flood control projects on Cayuga Creek. The earthen levee along the farmer's field near the Cayuga Village Trailer Park represents the only local flood protection effort. Other local activities are ongoing within the watershed to improve local drainage and stream flow, however there are no other flood protection projects planned or constructed within the basin.

Floodplain management regulations have been instituted in the communities located along the creek as a result of inclusion into the National Flood Insurance Program. These regulations provide a set of standards to define development within the floodplain, and limit damage due to flooding. The Federal Emergency Management Agency has been updating the Flood Insurance Studies as funding levels permit.

Photo. Exhibit 9: Northeast facing view of the north end of the existing earthen berm along Cayuga Creek adjacent to the "farmer's field" in the Town of Niagara (September 2001).

5.1.2 Damages Under the Without Project Condition

5.1.2.a Introduction

The National Economic Development (NED) contributions are defined as "increases in the net value of the national output of goods and services, expressed in monetary units. Contributions to NED are the direct net benefits that accrue in the planning area and the rest of the nation. Contributions to NED include increases in the net value of those goods and services that are marketed, and also of those that may not be marketed." (Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, p. 1, March 1983.). In accordance with Engineering Regulation (ER)1105-2-100, dated December 1990, a NED benefit-cost analysis is undertaken to assure that the value of the outputs (the NED benefits) produced by the proposed project exceeds the value of the inputs used (the NED costs).

Important assumptions used in the NED evaluation of the Without Project Condition as well as potential alternatives for Cayuga Creek are:

(1) All benefits and costs are expressed in February 2002 price levels unless noted;

(2) The project interest rate for the evaluation of NED benefits and costs is 6.125 percent;

(3) The project base year is 2005 and existing project conditions equate to 2002 conditions;

(4) The project period of evaluation is estimated at 50 years with appropriate operation & maintenance;

(5) Individuals in the floodplain are risk neutral and rational economic agents; and

(6) All elevations are expressed in feet and are understood to represent "Ft. NGVD" (Feet. National Geodetic Vertical Datum).

Following an investigation of the Cayuga Creek watershed by the study team, it was determined that the only damage area of concern is an approximate 0.5 mile area roughly bounded by Porter Road to the north, Tuscarora Road to the west, and Niagara Falls Boulevard Avenue to the South and Main Street to the east. The study area consists primary of Single-family residential, including a large mobile home park and several commercial structures. The inventory of potentially affected floodplain properties was derived from the area defined by the hydraulic and hydrologic evaluation of the 1.0 percent chance exceedance contour elevation.

5.1.2.b Commercial and Residential Inundation Damages

For this evaluation, damages to commercial and residential structures and their contents caused by inundation solely comprise the NED losses in the study area. The implementation of a project that decreases the likelihood and severity of inundation provides NED benefits by freeing the resources used to repair flood damages for other productive uses in the economy.

All commercial, residential, and related inundation damage estimates were calculated using the Hydrologic Engineering Center-Flood Damage Analysis, Flood Damage Reduction Risk-Based Analysis model (HEC-FDA). The HEC-FDA model uses data on structure types, values, and elevations along with area hydrologic data to estimate damages for flood events of different probabilities. These estimates are weighted by their probability of occurrence and converted into average annual inundation damage estimates. The risk analysis segment of the HEC-FDA model quantifies uncertainties for several relationships such as discharge-frequency, stage-discharge, stage-damage, and incorporates these risk uncertainties into economic and performance analyses of alternative flood damage reduction plans.

Structural values and structure types (commercial, residential, single story, two-story, with or without basement, etc.) were derived from using real property assessment database provided by Town of Niagara Assessor. The parcels contained within the study area were extracted for use in the evaluation. The valuation date or the real property price level for the assessment for these parcels is January 1, 2002.

Under consultation with the study hydraulic engineer and reviewing the water surface profiles for the Without Project Condition, the study area was delineated into five damage reaches. Damage reaches were derived based on the areas that would be flooded from specific stream segments. The damage reaches definitions are presented in Table 2 and the locations are depicted in Figure 8.

Table 2: Cayuga Creek Damage Reach Definitions.

Reach	Beginning Station	Ending Station	Bank	Index Location
B	6500	7000	Left	6942
A	7000	9800	Right	8437
D-2	8100	11200	Left	10837
C	9875	11900	Right	10837
D-1	12627	12627	Left	12627

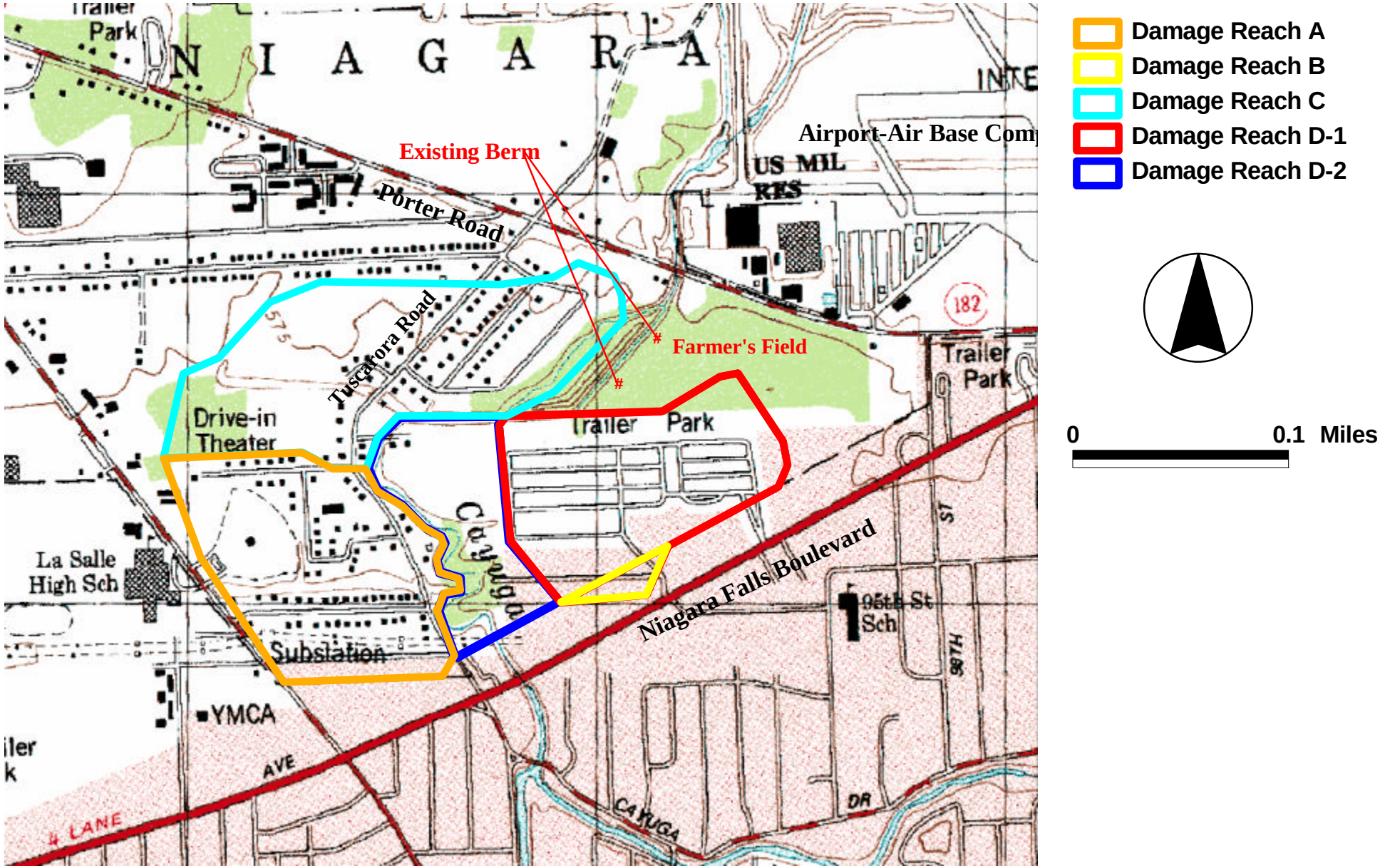

Figure 8: Damage Reaches in Study Focus Area (Town of Niagara).

First floor elevations for the structures were derived from existing available data. Base maps form the Town of Niagara had numerous spot ground elevations throughout the study area as well as many first floor elevations for various structures in the floodplain. Depth - Percent damage relationships by structure type were based on the best information available. For Residential single and two-story structures and contents, the functions were derived from IWR Report: "Depth-Damage Functions for Corps of Engineers Flood Damage Reduction Studies, (Davis, Carlson, Mosher). Depth-percent damage curves for mobile homes and their contents were obtained from empirically derived functions developed in the New Orleans District. Depth-percent curves for Residential, no basement were used as a proxy for the dozen commercial properties in the floodplain. For all properties, content values were estimated at 50 percent of the structure values. Table 3 presents the distribution of structures in the study area by damage reach and structure type. Table 4 presents the distribution of value of structures in the study area by damage reach and structure type. Table 5 presents the expected annual damages by damage categories and damage reaches for the Without Project Condition.

Table 3: Number and Distribution of Structures by Damage Reach and Structure Type.

	Number of Structures in Study Area					
	Categories	Damage Reach				
		A	B	C	D-1	D-2
Residential	1n	4				
	2n	-		1		
	1b	39		24		
	2b	53		41		
	Mobile	-			520	30
	Unknown	4				
Commercial		11	1			1
TOTAL		**111**	**1**	**66**	**520**	**31**

Table 4: Number and Distribution of Value of Structures by Damage Reach and Structure Type.

	Value of Structures in Study Area					
	Categories	Damage Reach				
		A	B	C	D-1	D-2
Residential	1n	530				
	2n	-		135		
	1b	3,398		2,382		
	2b	4,400		4,642		
	Mobile	-			5,557	540
	Unknown	136				
Commercial		4,808	387			6
TOTAL		**13,270**	**387**	**7,159**	**5,557**	**546**

(1) Damages in 1,000s.

Table 5: Expected Annual Damages by Damage Categories and Damage Reaches for the Without Project Condition.

Stream Name	Damage Reach Description	Damage Categories			Total
		Commercial	Unknown	Residential	
Cayuga Creek	Damage Reach B	0.59	0.00	0.00	0.59
	Damage Reach A	11.43	0.19	18.39	30.01
	Damage each D-2	0.02	0.00	1.04	1.06
	Damage Reach C	0.00	0.00	43.85	43.85
	Damage Reach D-1	0.00	0.00	122.52	122.52
TOTAL		**12.03**	**0.19**	**185.80**	**198.02**

(1) Damages in 1,000s.

5.1.3 Expected Future Conditions

In the future, state, county and local leaders and other involved organizations and partners will likely continue to place a high priority on flood protection in the Cayuga Village Trailer Park area. Watershed drainage, natural resources conservation and restoration, and issues related to overall watershed health, will also be a priority. This includes protecting and preventing flood damages; unifying watershed drainage, planning and development; restoring and managing of floodplains, wetlands, riparian corridors, recreational resources, fish and wildlife populations and habitats; and water quality.

The trend towards migration of the regional population away from the metropolitan area outward into the suburban and rural areas is likely to continue. The Cayuga Creek basin is an attractive place to live and has the ability to support further residential, commercial and industrial uses with infrastructure expansion. These factors will likely support future population growth and land use changes. Urban and suburban growth in the basin will result in significant potential for increased drainage issues and point and non-point water quality impacts.

In addition, increased development of floodplain lands and tributary watersheds, although completed in accordance with floodplain regulations, will place more infrastructure at risk from flooding and more than likely increase peak flows and volume of runoff to the main-stem creek and remaining floodplains. Accordingly, as the basin develops, unless there is proactive unified watershed planning and management, flooding and the need for protection will remain a primary need as land uses change.

There will be future increased demands for public access, recreation uses, and other demands affecting water quality and habitat integrity. At the same time, it is likely that community concern to protect and restore indigenous wildlife habitat, and to be able to enjoy high-quality native landscapes from an aesthetic and recreational viewpoint, will grow.

5.2 Alternative Plans

For this analysis, two alternative plans were developed that would provide varying levels of flood protection in the Town of Niagara. Figure 9 shows the general location and features of each alternative. Plan 1 is a comprehensive plan that would provide a 200-year level of protection and

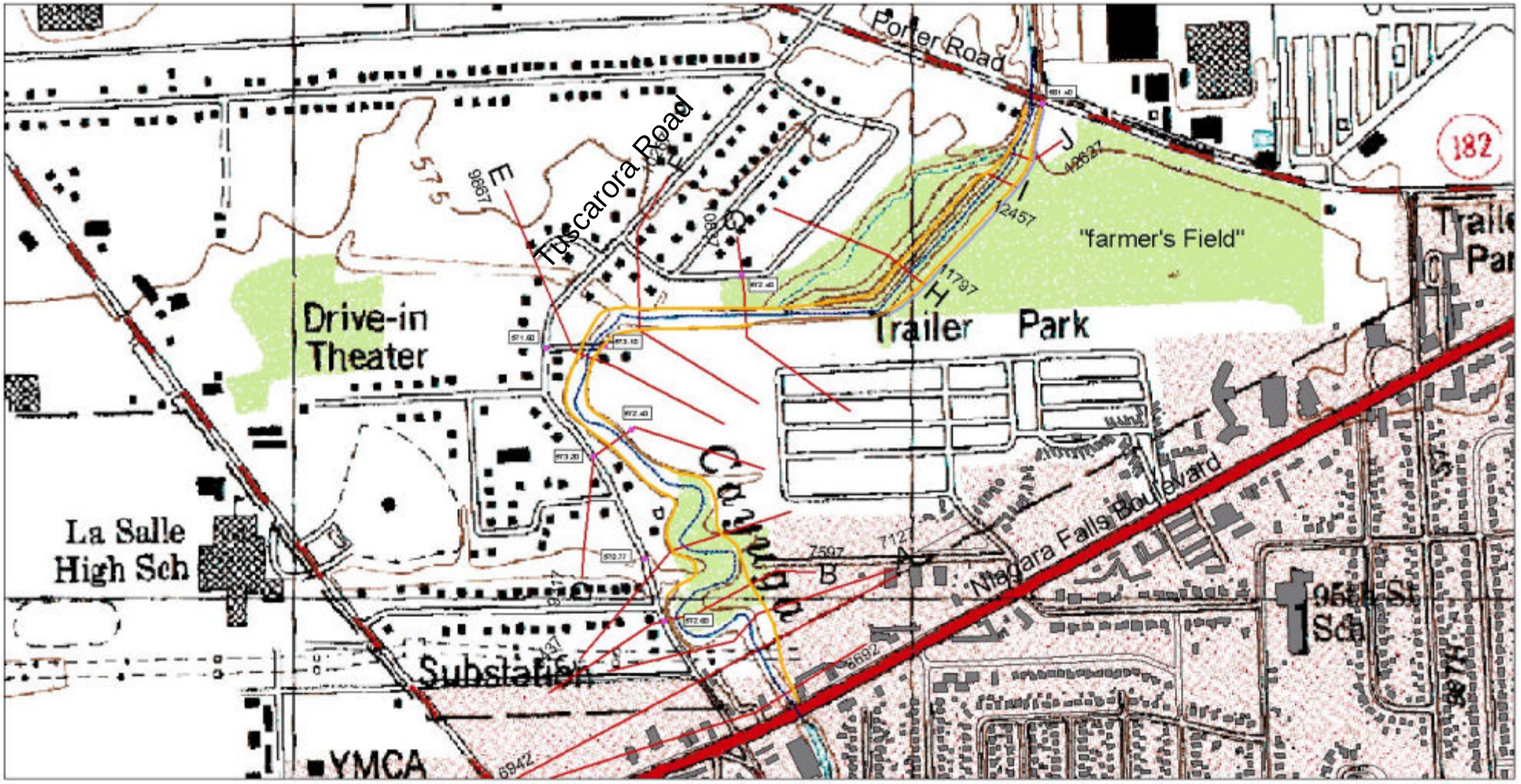

Figure 9:
Alternative Plans Evaluated For Flood Protection in the Town of Niagara.

encompasses the entire reach of Cayuga Creek between Niagara Falls Boulevard and Porter Road. Plan 2 is much smaller in scope and complexity and focuses specifically on protecting the Cayuga Creek Trailer Park and vicinity.

Alternative Plans 1 and 2 were formulated and subsequently simulated in the hydraulic model to see if they would provide adequate protection. A preliminary evaluation of benefits and costs associated with Plans 1 and 2 was also completed. Other non-structural and structural measures were also identified that would provide flood damage reduction benefits.

Alternative Plan 1: A combination of 8,900 lineal feet of 2 to 6 foot high earthen berms, 1,600 lineal feet of 3 to 4 foot high floodwalls, and 5,300 lineal feet of clearing and snagging between Niagara Falls Blvd. and Porter Rd. This alternative will provide most everyone along this reach with a 200-yr. level of protection. The berms and floodwalls would run along both sides of Cayuga Creek. The berms would be placed along the channelbanks or overbanks where room permits. The floodwalls would be placed at locations where there is not enough room for the earthen berms. Clearing and snagging would help increase the capacity in the channel and improve the hydraulic capability of the watercourses to pass storm flows through the developed areas.

Alternative Plan 2: Providing 1,400 lineal feet of 4 to 7 foot high earthen berms along the farmer's field with no clearing and snagging and no floodwalls. Initial damages show that the trailer park has extensive damages due to the berm in the farmer's field breaching and/or overtopping. Building a permanent berm with a 500-yr. flood protection would greatly reduce the damages to the trailer park and at costs much less than that of alternative Plan 1.

Incremental variations of the two plans presented would be evaluated during the feasibility study to define the most engineeringly feasible, environmentally sound and economically justifiable plan for implementation. This includes a detailed quantification of the benefits and costs associated with each alternative as well as incremental analysis of other structural and non-structural alternatives that would be considered during a feasibility study including:

- Flood Warning System/Preparedness Plan
- Flood Proofing
- Relocation of Structures
- Restoration of Floodplains, Wetlands and other Natural Attenuation Systems

The feasibility phase study would also include a detailed environmental evaluation of alternative plans and preparation of the necessary National Environmental Policy Act (NEPA) environmental documentation and coordination in accordance with applicable Federal Statutes, Executive Orders and Memorandums.

5.2.1 Economic Efficiency

Two measures of economic efficiency were calculated to measure the economic efficiency of each of the two proposed alternative plans of improvement. The measures are the benefit to cost ratio (BCR) and net discounted benefits. The benefit to cost ratio is the ratio of average annual benefits to average annual costs. Tables 6 through 9 set forth the Residual Annual Damages by Damage Categories and Damage Reaches for each plan including a summary comparison of plans.

Table 6: Expected Residual Annual Damages by Damage Categories and Damage Reaches for Plan 1.

Stream Name	Damage Reach Description	Damage Categories			Total
		Commercial	Unknown	Residential	
Cayuga Creek	Damage Reach B	0.31	0.00	0.00	0.31
	Damage Reach A	6.40	0.09	9.06	15.55
	Damage each D-2	0.01	0.00	0.87	0.88
	Damage Reach C	0.00	0.00	12.87	12.87
	Damage Reach D-1	0.00	0.00	20.36	20.36
TOTAL		**6.72**	**0.09**	**43.160**	**49.97**

(1) Damages in 1,000s.

Table 7: Expected Residual Annual Damages by Damage Categories and Damage Reaches for Plan 2.

Stream Name	Damage Reach Description	Damage Categories			Total
		Commercial	Unknown	Residential	
Cayuga Creek	Damage Reach B	0.59	0.00	0.00	0.59
	Damage Reach A	11.43	0.19	18.39	30.01
	Damage each D-2	0.02	0.00	1.06	1.08
	Damage Reach C	0.00	0.00	45.70	45.70
	Damage Reach D-1	0.00	0.00	0.00	0.00
TOTAL		**12.03**	**0.19**	**65.15**	**77.37**

(1) Damages in 1,000s.

Table 8: Comparison of Expected Residual Annual Damages by Damage Categories and Plans.

Plan Name	Plan Description	Damage Categories			Total
		Commercial	Unknown	Residential	
Without	Without Project Condition	12.03	0.19	185.80	**198.02**
Plan 1	Extensive Levee & Floodwall Plan with 200-Year Protection	6.72	0.09	43.16	**49.97**
Plan 2	Levee & Floodwall Plan Protecting Primarily Damage Reach D	12.03	0.19	65.15	**77.37**

(1) Damages in 1,000s.

Table 9: Comparison of Expected Annual Damages Reduced and Distributed by all Plans.

Plan Name	Plan Description	Expected Annual Damages			Probability Damages Reduced Exceeds Indicated Values		
		Total Without Project	Total With Project	Damages Reduced	.75	.50	.25
Without	Without Project Condition	198.02	198.02	0.00	0.00	0.00	0.00
Plan 1	Extensive Levee & Floodwall Plan with 200-Year Protection	198.02	49.97	148.05	76.94	131.38	204.82
Plan 2	Levee & Floodwall Plan Protecting Primarily Damage Reach D	198.02	77.37	120.65	64.43	106.45	162.62

(1) Damages in 1,000s

Table 10: Economic Efficiency.

Plan Components/Cost Items	Plan 1[1]	Plan 2
Total Investment Cost	$4,644,000	$1,080,000
Average Annual Benefits	$148,100	$120,700
Average Annual Costs	$309,800	$70,700
Net Benefits	($161,800)	($49,900)
Benefit Cost Ratio	**0.50 to 1**	**1.7 to 1**

Project Evaluation Period 50-Years and 6.125% Interest Rate.

All benefits and costs shown in Table 10 reflect February 2002 price levels. Total Investment Costs include total implementation costs, interest during construction and a Partial Payment Factor of 064554. The benefit to cost ratios for each of the proposed plans of improvement are 0.5 to 1 for Plan 1 and 1.7 to 1 for Plan 2. Net discounted benefits are the difference between average annual benefits and average annual costs. Net discounted benefits are negative ($161,800) for Plan 1 and positive, $49,900 for Plan 2. The benefit cost evaluation confirms that there is a federal interest in that we have identified a plan of improvement that is economically justified.

5.3 Opportunities Warranting Further Evaluation

5.3.1 Other Water Resources

The following is a discussion of other water and related resources within the Cayuga Creek basin.

5.3.1.a Land Use

Land uses in the basin vary widely from rural residential and agricultural to commercial/industrial. North of the Niagara Falls Airport-Air Force Base complex, in the Town of Lewiston, the Tuscarora Nation, and the Towns of Wheatfield and Cambria, land uses consist of mixed residential and agriculture and open lands, although this is changing as infrastructure increases and improves and residential and commercial development progresses outward from the Niagara Falls metropolitan area. There are also scattered wooded stands throughout. Private residences are situated primarily along Lockport, Saunders Settlement, and Walmore Roads.

The airport-air base complex occupies approximately 2,000 acres of flat grassland virtually cleared of trees and brush. Southward in the watershed, much of the lands in the Town of Niagara and the Cities of Niagara Falls and North Tonawanda are predominantly suburban residential and commercial development. Industrial activities are concentrated mostly in the City of Niagara Falls.

In the vicinity of the Cayuga Village Trailer Park, the setting consists of vacant land in varying stages of vegetative succession. Surrounding land use to the west and south is predominantly residential, while the developed areas to the southeast are commercial and industrial. South of Niagara Falls Boulevard, the creek basin is urbanized. Development is commercial and residential in nature, with commercial development found primarily along major thoroughfares.

5.3.1.b Watershed Topography

The Cayuga Creek basin is of limited topographic complexity and variation. Cayuga Creek is a slightly meandering system originating in flat topography at an elevation near 625 feet mean sea level (msl). Progressing southward the creek continues into relatively level topography and it takes on characteristic flows as it meanders through a relatively defined main channel and a mosaic of lowland floodplain landscapes. The creek courses through this level landscape where it eventually converges with the Little River approximately 10 miles from its source.

5.3.1.c Floodplains and Wetlands

Figure 10 depicts the location of the 1996 FEMA 100-year floodplain within the Cayuga Creek basin. Channelization of portions of Cayuga Creek and filling in other areas has altered the limits of the 100-year floodplain. Within the study focus area, the 100-year floodplain map indicates that the area immediately adjacent to Cayuga Creek is within the 100-year floodplain. However, preliminary calculations conducted by Buffalo District hydraulics and hydrology personnel indicate that the 100-year floodplain may encompass a significantly larger portion of the focus area. Detailed topographical information would need to be gathered to determine a more precise location of the floodplain.

Federal and NYSDEC jurisdictional depressional and riverine freshwater wetlands are located throughout the watershed and range in vegetative succession from emergent to forested covertypes. Riverine and shoreline (littoral zone) vegetated shallows also occur sporadically along and within Cayuga Creek and its tributaries as emergent and aquatic bed communities occupying shoals, side channels and backwater areas. Figure 11 shows the location of known NYSDEC Freshwater Wetlands within the watershed and Figure 12 shows the location of known Federal wetlands within the watershed.

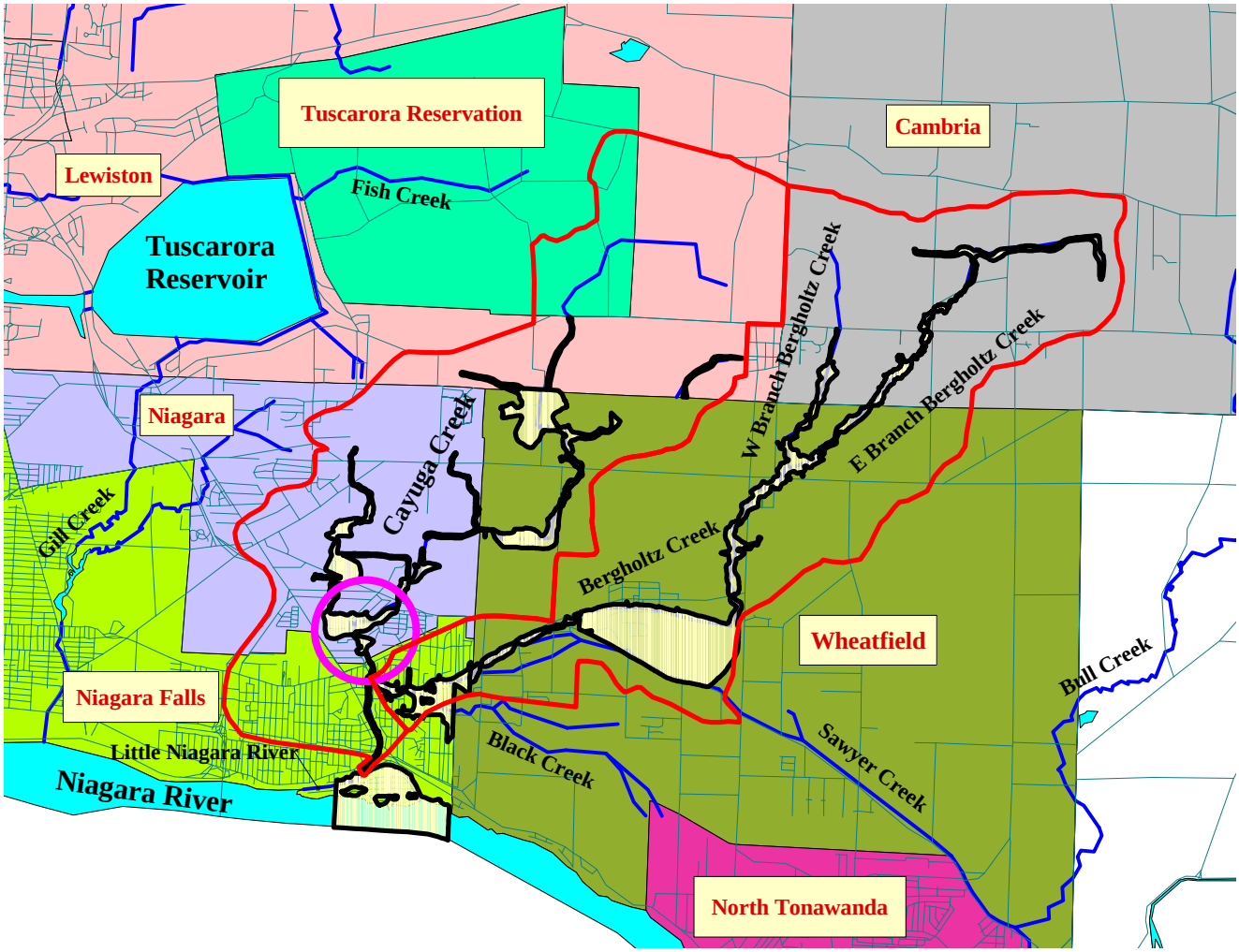

Figure 10: 1996 FEMA 100-Year Floodplains.

Cayuga Creek-Bergholtz Creek Watersheds
Study Focus Area
1996 FEMA 100-Year Floodplain
Roads
Creeks & Streams
Lakes & Rivers

0.7 0 0.7 1.4 2.1 Miles

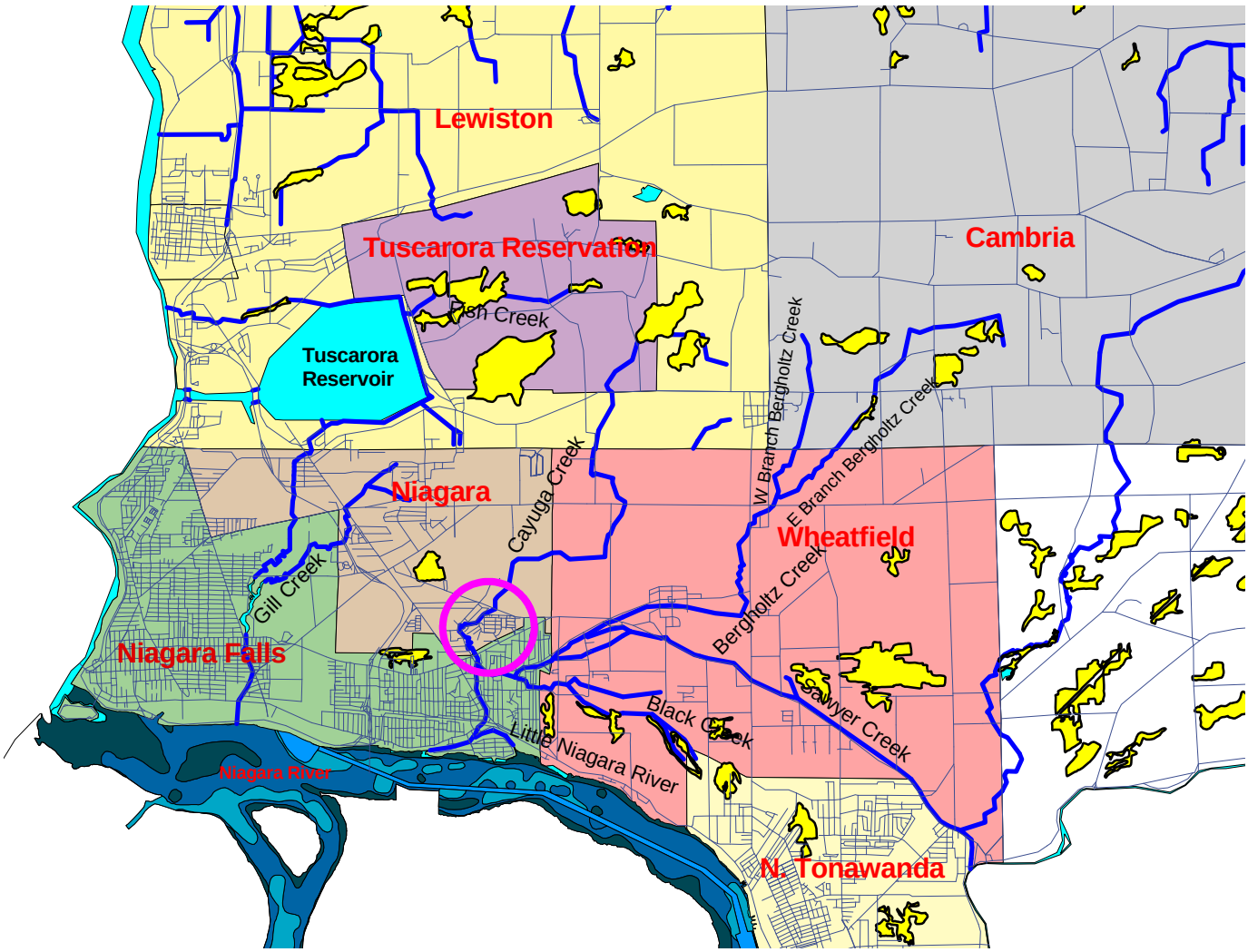

Figure 11: NYSDEC Freshwater Wetlands.

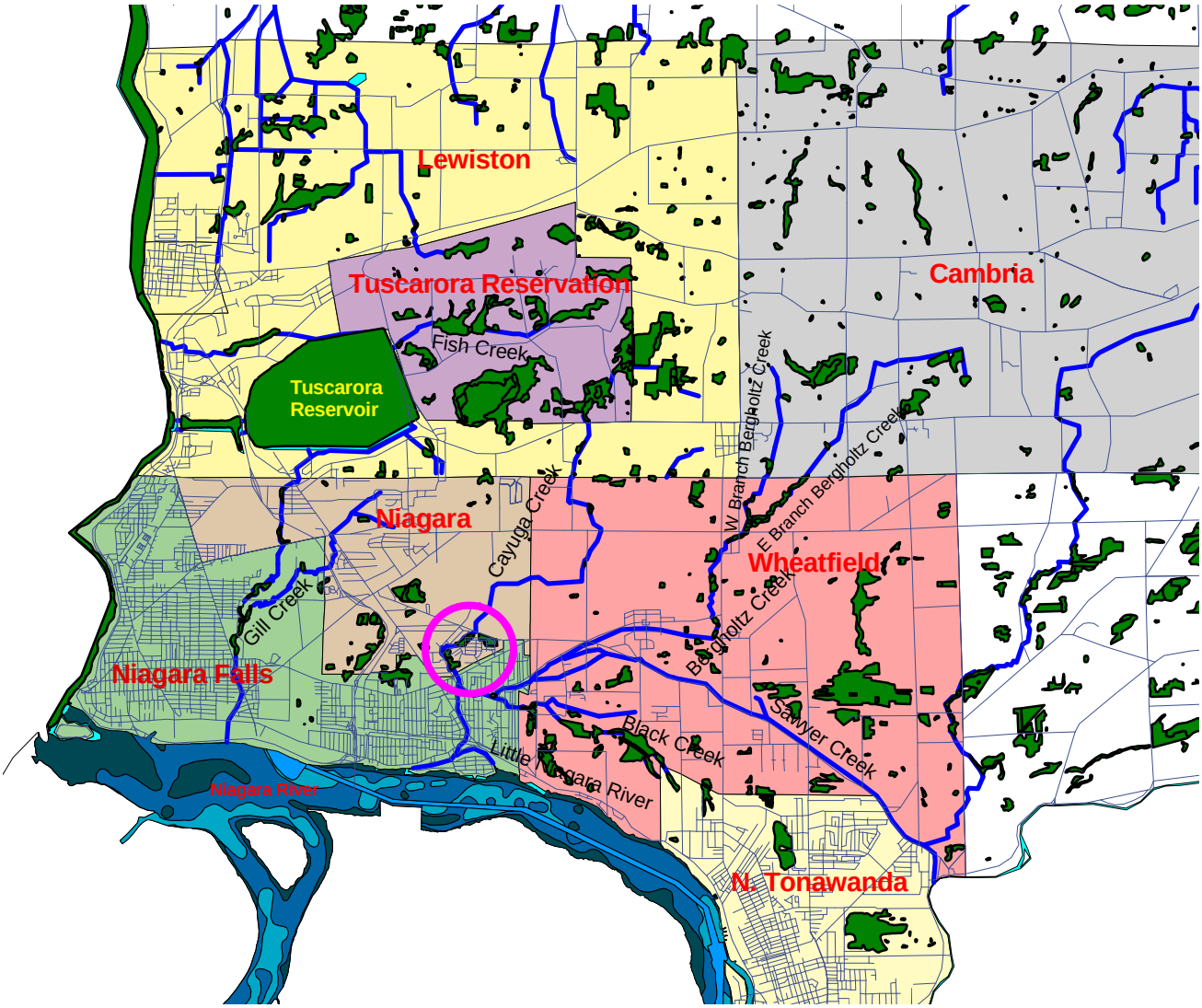

Figure 12: USFWS National (Federal) Wetlands Inventory.

Photo. Exhibit 10: South facing view of emergent wetland along the east bank of Cayuga Creek just downstream of the confluence with Bergholtz Creek in the City of Niagara Falls (February 2002).

The most notable NYSDEC and Federal wetlands on Cayuga Creek are located at the creek headwaters point west of Bridgeman Road and north of Saunders Settlement Road (Rt. 31) in the Town of Lewiston (see Figures 11 and 12). These wetlands provide some wetland functions and benefits, but were ditched and drained in the past for agriculture and consequently exist in a functionally degraded state. Other notable areas of NYSDEC and Federal freshwater wetlands are located along and adjacent to Bergholtz, Black, and Sawyer Creeks and elsewhere throughout the watershed.

Land use changes in the Cayuga Creek corridor have incrementally converted much of the floodplain, wetlands and riparian systems to other uses including residential, commercial and industrial development. This has occurred most significantly within the Town of Niagara and the City of Niagara Falls.

There are no NYSDEC Freshwater Wetlands within or adjacent to the study focus area between Porter Road and Niagara Falls Boulevard. The U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI Map) depicts several areas of potential Federally regulated wetlands. A wetland delineation conducted by Earth Dimensions, Inc. in 1998 confirmed that various areas of wetland are located within portions of the study focus area.

Photo. Exhibit 11: Small area of emergent wetlands associated with Cayuga Creek on the west side of the Walmore Road bridge in the Town of Wheatfield (February 2002).

5.3.1.d Fish and Wildlife Populations and Habitat

Cayuga Creek supports typical fish and wildlife species endemic to the region and ecology of the watershed. Great blue heron, green heron, wood ducks, black ducks, mallard ducks and Canada geese are seasonal regulars all along the creek. Muskrat, mink, beaver; white-tail deer, raccoon, opossum, and gray squirrel are among the more common terrestrial fauna. Painted and snapping turtles, green frog, leopard frog and bullfrogs and salamanders live in and along the creek and associated wetlands.

The lower half of the watershed is highly developed and habitat is fragmented, and in places, limited to the immediate narrow riparian corridor. Very little organized data exists that quantifies the loss of habitats on Cayuga Creek. Generally, it is understood that the northern third of the basin retains the most continuous wildlife habitat due mostly to the relative lack of development and lack of significant fragmentation. In this portion of the watershed the main-stem corridor contains a mosaic of upland, wetland and mesic vegetative covertypes and community associations. Much of the land in the watershed was at one time farmed so areas range from successional herbaceous communities and shrub-land to subclimax and climax forest types. Fish habitat is in most respects fair, however warm water temperatures and low flows during hot, dry summers may limit the fishery especially within the upper reaches of Cayuga Creek.

Although measures are being taken to improve conditions in the watershed, historically there has been loss and diminishment of the quantity and quality of the fish and wildlife habitat. This is due to changes in land use, industrial development and the effects of point and non-point source discharges on water quality. This is most true west of Walmore Road through the airport-air base complex southward through the Town of Niagara and the City of Niagara Falls. In these segments upland, wetland, riparian, and aquatic habitats have been variably degraded, fragmented or removed for roads, buildings, channelization, and bank stabilization.

Although, conservation programs and regulations, local initiatives and ordinances, and state and federal wetlands regulations have reduced the rate of loss and degradation of habitats, and are attempting to restore some habitats, the effects of the previous land uses and activities are still evident and degradation continues. Also, non-native plant infestations including purple loosestrife (*Lythrum salicaria*) and common reed (*Phragmites australis*) disrupt native communities and diminish populations of many at risk species.

5.3.1.d.1 Vegetation

The outer extremes of the watershed consist of agricultural crops and vacant land in various stages of vegetative succession. The downstream portions of the watershed are more heavily developed and contain fewer expansive vegetated areas. A 1998 wetland delineation report conducted by Earth Dimensions, Inc. within the study focus area of the watershed indicated vegetative communities which include shrub/sapling, successional shrubland, upland shrub/forest, successional upland field, shrub/forested wetland and wet meadow. The following is a summary of dominant vegetative species identified during the investigation and characteristic of the watershed.

Table 11: Summary of Dominant Vegetative Species.

Scientific Name	Common Name
Acer negundo	Box elder
Acer rubrum	Red maple
Agrostis alba	Redtop grass
Allaria officinalis	Garlic mustard
Aster lateriflorus	Calico aster
Aster novae-angliae	New England aster
Aster pilosus	White heath aster
Carex crinita	Fringed sedge
Carex tribuloides	Blunt broom sedge
Carya ovata	Shag-bark hickory
Cephalanthus occidentalis	Button-bush
Cornus amomum	Silky dogwood
Cornus foemina ssp. Racemosa	Gray-stemmed dogwood
Crataegus sp.	Hawthorn
Dactylis glomerata	Orchard grass
Dipsacus sylvestris	Teasel
Elymus virginicus	Virginia wild rye
Epilobium coloratum	Purple-leaved willow-herb
Euthamia graminifolia	Flat-top golden-rod
Fragaria virginiana	Strawberry
Fraxinus pennsylvanica	Green ash
Geum canadense	White avens
Glyceria striata	Fowl manna grass
Impatiens capensis	Spotted touch-me-not
Juglans nigra	Black walnut
Juncus effusus	Soft rush
Leersia oryzoides	Rice cutgrass

Lotus corniculatus	Birds-foot trefoil
Lysimachia nummularia	Creeping jennie
Lythrum salicaria	Purple loostrife
Onoclea sensibilis	Sensitive fern
Phleum pratense	Timothy
Phragmites australis	Common reed
Poa pratensis	Canada bluegrass
Polygonum hydropiperoides	Smartweed
Populus tremula	Quaking aspen
Quercus bicolor	Swamp white oak
Quercus macrocarpa	Bur oak
Quercus palustris	Pin oak
Quercus rubra	Red oak
Rhus typhina	Staghorn sumac
Rubus occidentalis	Black raspberry
Sambucus canadensis	Elderberry
Solidago canadensis	Canada golden-rod
Solidago rugosa	Rough-stemmed golden-rod
Tilia americana	American basswood
Toxicodendron radicans	Poison ivy
Ulmus americana	American elm
Viburnum recognitum	Northern arrow-wood
Vitis aestivalis	Summer grape

5.3.1.d.2 Fisheries

Fish habitat is in most respects fair, however warm water temperatures and low stagnant flows during hot, dry summers may limit the fishery especially within the upper and lower reaches of Cayuga Creek. The upper reaches of Cayuga Creek are fairly productive despite the stream's relatively narrow width and shallow flows. Field survey personnel noted numerous frogs, caddisfly larvae, and crayfish near the Saunders Settlement Road bridge. In many areas, the creek bottom was covered with filamentous algae; elsewhere, emergent vegetation virtually concealed the channel. The creek also supports large populations of suckers, chubs, and carp. It is probable that occasionally bass, sunfish, perch, and pike move into the lower creek from the Little River, although they may not survive. A fisheries Inventory conducted by the NYSDEC in June of 2001 within Cayuga Creek found existing species to include those listed in Table 12. Table 13 lists other fish species found in previous sampling studies.

Table 12: Fish Species Identified in Cayuga Creek in June 2001.

Scientific Name	Common Name
Amieurus nebulosus	Brown bullhead
Ampbloplites rupestris	Rock bass
Carassius spp.	Goldfish
Catostomus commersoni	White sucker
Cualea inconstans	Brook stickleback
Etheostoma nigrum	Johnny darter

Lepomis cyanellus	Green sunfish
Lepomis gibbosus	Pumpkinseed sunfish
Lepomis macrochirus	Bluegill sunfish
Nocomis micropogon	River chub
Notemigonus crysoleucas	Golden shiner
Notropis antherinoides	Emerald shiner
Notropis cornutus	Common shiner
Notropis hudsonius	Spottail shiner
Pimephales notatus	Bluntnose minnow
Pimephales promelas	Fathead minnow
Semotilus atrmaculatus	Creek chub
Umbra limi	Central mudminnow

Table 13: Other Fish Species Found in Previous Sampling Studies (1928 & 1970s-80s).

Scientific Name	Common Name
Aphredoderus sayanus	Pirate perch
Cyprinus carpio carpio	Common carp
Dorsoma cepedianum	Gizzard shad
Esox americanus	Grass pickerel
Esox lucius	Northern pike
Luxilus chrysocephalus	Striped shiner
Nocomis biguttatus	Hornyhead chub

An inventory conducted within the Niagara Falls Air Force Base by the U.S. Fish and Wildlife Service between 1997 to 1999 found similar species in addition to Largemouth Bass (*Micropterus salmoides*). Common Carp (*Cyprinus carpio*) was also found, confirming the NYSDEC opinion that the creek contains habitat for this species.

5.3.1.d.3 Terrestrial Mammals

Extensive clearing for agriculture has severely reduced wildlife habitats in the upper basin. The scattered brush and open fields remaining can support population of rabbits, pheasant, skunk, small rodents, and a variety of common songbirds. While surveying the creek, project personnel noted evidence of muskrats and raccoons along the banks, and often observed ducks swimming in the creek.

Downstream of Niagara Falls Boulevard, urban development has severely reduced available wildlife habitats. Mammal species found during the USFWS inventory at the Niagara Falls Air Force Base are generally representative of the watershed and include those listed in Table 14.

Table 14: Mammal Species Inventoried by the USFWS at the Niagara Falls Air Force Base.

Scientific Name	Common Name
Canus Lutrans	Coyote
Castor Canadensis	Beaver
Cryptotis parva	Least shrew

Marmota monax	Woodchuck
Mephitis mephitis	Striped skunk
Microtus pennsylvanicus	Meadow vole
Odocoileus virginianus	Whitetail deer
Ondatra zibethica	Muskrat
Peromyscus maniculatus	Deer mouse
Procyon lotor	Raccoon
Sorex dispar	Long-tailed shrew
Sylvilagus floridanus	Eastern cottontail rabbit
Vulpes vulpes	Red fox

Other species most likely found in the watershed include:

Scientific Name	Common Name
Mustela vision	Mink
Sciurus carolinensis	Gray squirrel
Tamias striatus	Chipmunk
Tamiasclurus hudsonicus	Red squirrel

5.3.1.d.4 Avian Wildlife

A detailed inventory of bird species within the Niagara Falls Air Force Base was conducted by the U.S. Fish and Wildlife Service between November 1997 and July 1999. Species found are listed in Table 15 and are endemic to the region and watershed conditions.

Table 15: Avian Wildlife Species Identified by the USFWS at the Niagara Falls Air Force Base.

Scientific Name	Common Name
Actitis macularia	Spotted sandpiper
Agelaius phoeniceus	Red-wing blackbird
*Ammodramus savannarum****	Grasshopper sparrow
Amphispiza bilineata	Black-throated sparrow
Anas platyrhynchos	Mallard
Anas rubripes	American black duck
Ardea alba	Great egret
Ardea herodias	Great blue heron
*Asio flammeus**	Short-eared owl
*Bartramia longicauda***	Upland sandpiper
*Botaurus lentiginosus****	American bittern
Branta canadensis	Canada goose
Buteo jamaicensis	Red-tailed hawk
Carduelis tristis	American goldfinch
Carpodacus purpureus	Purple finch
*Circus cyaneus***	Northern harrier
Charadrius vociferus	Killdeer

Columbia livia	Rock dove
Corvus brachyrhynchos	American crow
Dolichonyx oryzivorus	Boblink
Dumetella carolinensis	Gray catbird
*Eremcphila alpestris****	Horned lark
Fulica americana	American coot
Hylocichla mustelina	Wood Thrush
Larus spp.	Gulls
Melospiza melodia	Song sparrow
Molothrus ater	Brown-headed cowbird
Nyctea scandiaca	Snowy owl
Nycticorax nycticorax	Black-crowned night heron
Passer domesticus	House sparrow
Passerculus sandwichensis	Savanna sparrow
Phasianus colchicus	Ring-neck pheasant
Pipilo erythrophthalmus	Eastern towhee
Poecile atricapilla	Black-capped chicadee
Quiscalus quiscula	Common grackle
Riparia riparia	Bank swallow
Sayornis phoebe	Eastern phoebe
Scolopax minor	American woodcock
Spizella arborea	American tree sparrow
Spizella passerina	Chipping sparrow
Spizella pusilla	Field sparrow
Stelgidopteryx serripennis	Northern rough-winged swallow
Sturnella magna	Eastern meadowlark
Sturnus vulgaris	European starling
Tachycineta bicolor	Tree swallow
Turdus migratorius	American robin
Tyrannus tyrannus	Eastern kingbird
Zenaida asiatica	Mourning dove
Zonotrichia albicollis	White-throated sparrow
	Domestic goose
	Flycatcher spp.
	Woodpecker spp.

* State endangered status ** State threatened status *** State special concern status

5.3.1.d.5 Reptiles and Amphibians

The USFWS conducted an inventory for reptiles and amphibians within the Niagara Falls Air Force Base between 1997 and 1999. Species identified are generally representative of the watershed and listed in Table 16.

Table 16: Reptiles and Amphibians Identified by the USFWS at the Niagara Falls Air Force Base.

Scientific Name	Common Name
Chelydra serpentina	Snapping turtle
Chrysemys picta	Painted turtle
Rana pipiens	Northern leppard frog
Rana sylvatica	Wood frog
Thamnophis sirtalis	Garter snake

In addition to these species, the USFWS reported a possible siting of eastern box turtle (*Terrapene carolina carolina*), a New York State Special Concern species.

5.3.1.d.6 Rare, Threatened, Endangered & Special Concern Species

A fish and wildlife inventory and Threatened/Endangered Species Study was conducted between 1997-99 by the U.S. Fish and Wildlife Service on the Niagara Falls Air Force Base. The investigation identified six (6) avian species that are threatened, endangered or special concern. Of these species, the upland sandpiper and grasshopper sparrow are believed to use the watershed as breeding habitat. In addition to the avian species, the USFWS recorded a possible siting of box turtle.

The NYSDEC Bureau of Fisheries conducted an investigation to confirm the potential for pirate perch habitat in Cayuga Creek. Although no occurrences were noted during 2000-2001, the historic presence of this species is considered significant by the NYSDEC. Pirate perch is not listed as a protected species, but has been recommended for inclusion on the special concern list. The presence of pirate perch has not been confirmed in Cayuga Creek for approximately 70 years. Table 17 summarizes the known or suspected species within the Cayuga Creek watershed.

Table 17: Known or Suspected Threatened, Endangered or Special Concern Species within the Cayuga Creek Watershed.

Scientific Name	Common Name	State Status
Aphredoderus sayanus	Pirate perch	Proposed special concern
Ammoodramus savannarum	Grasshopper sparrow	Special concern
Asio flammeus	Short-eared owl	Endangered
Bartramia longicauda	Upland sandpiper	Threatened
Botaurus lentiginosus	American bittern	Special concern
Circus cyanus	Northern harrier	Threatened
Eremphila alpestris	Horned lark	Special concern
Terrapene carolina carolina	Eastern box turtle	Special concern

During the feasibility phase, further coordination with the New York Natural Heritage Program and U.S. Fish and Wildlife Service would be required to determine any potential impacts to rare, threatened, endangered or special concern species or their designated critical habitat.

5.3.1.d.7 Soils/Geology

The Cayuga Creek watershed is part of the Erie-Ontario lake plain. Dominant soils in this area consist of clayey and silty stone-free sediments over loamy glacial till sediments.

5.3.1.e Water Quality

Water Quality has been an issue in the Erie-Niagara Basin including Cayuga Creek for many decades dating as far back as the early 1900's especially in the industrialized lower half of the watershed. The most recent watershed-wide evaluation of water quality was the 1975 Cayuga Creek Water Quality Study. The report for this study set forth the qualitative and quantitative results of water quality conditions on the creek during that time period.

Generally, Cayuga Creek remains impaired by pollutants originating from State Pollution Discharge Elimination System (SPDES) outfall points, Combined Sewer Overflows (CSOs), industrial discharges, and Sanitary Sewer Overflows (SSOs). Non-point source contribution of pollutants and suspended sediment are also contributing factors to water quality problems. Several inactive hazardous waste sites are located within the watershed, including the study focus area (see Figure 5). In addition, dense residential development and the presence of the Niagara Falls Air Force Base to the north have depleted much of the creek's buffer and created substandard water quality conditions.

Photo. Exhibit 12: Southeast facing view of the east bank of Cayuga Creek at the Milestrip Bridge in the City of Niagara Falls. Note the turbid water conditions, discharge pipe and poor shoreline conditions (February 2002).

Presently, the NYSDEC monitors water quality on Cayuga Creek and maintains records of conditions. Qualitative information and descriptions of the water quality conditions exist in various reports, but relatively few watershed based organized studies have been conducted on Cayuga Creek that comprehensively quantify the water quality conditions.

Photo. Exhibit 13: Storm sewer outfall into Cayuga Creek at the Lindbergh Avenue bridge in the City of Niagara Falls (February 2002).

Photo. Exhibit 14: Typical view of the junk and debris that commonly occurs along the banks of Cayuga Creek and degrades many aspects of the creek including water quality, habitat, and aesthetics. This image was taken north of the Niagara Falls Boulevard bridge in the City of Niagara Falls (February 2002).

5.3.1.f Bank Stability (Shoreline Erosion)

Stream bank and channel erosion and the resulting suspension of sediment are significant and recognized problems throughout the watershed, particularly within the City of Niagara Falls. The constriction and concentration of creek flows, channel modification, concentrated point source discharges, loss of woody riparian vegetation, altered hydrologic characteristics, and fluctuations in water levels associated with Power Authority of the State of New York management of the Niagara River are contributing causes to this problem. Stream erosion continues to reduce the quantity and quality of the shoreline, the water column, vegetated shallows and the riparian corridor and overhanging trees and shrubs, which is subject to undercutting and deadfall.

Photo. Exhibit 15: North facing view of fallen tree along unstable shoreline in the City of Niagara Falls at the Lindbergh Avenue bridge. Unstable shoreline causes loss of valuable trees and riparian habitats and dead fall such as this can cause obstructions to flow (February 2002).

Photo. Exhibit 16: South facing view of dead fall and degraded shoreline conditions in the City of Niagara Falls from the Milestrip Road bridge (February 2002).

Photo. Exhibit 17: View of Cayuga Creek near its headwaters immediately Northeast of Chew Road on the Tuscarora Reservation. Note the relatively narrow channel and wooded riparian conditions (February 2002).

Photo. Exhibit 18: South facing view of Cayuga Creek from the Lindbergh Avenue bridge in the City of Niagara Falls. The location is downstream of the Bergholtz Creek confluence less than 1 river mile from the mouth in the City of Niagara Falls. Note the change in channel conditions compared to Photo. Exhibit 14 (February 2002).

Throughout this study municipal leaders and involved agencies such including the City of Niagara Falls, Niagara County, the Niagara County Soil and Water Conservation District, and the NYSDEC emphasized the need for stream bank erosion protection, restoration and management. Examples exist throughout the watershed of bank erosion on public and private lands. Specific examples include the Cayuga Creek banks in the City of Niagara Falls.

5.3.1.g Historic/Archaeological Sites

As stated in a letter dated 16 January 2002 from the New York State Office of Parks, Recreation and Historic Preservation (NYSOPRHP), numerous archaeological sites and historic structures are known to fall within the Cayuga Creek Basin. In addition, there are likely many more historic/cultural properties that have not been reported. Further consultation with NYSOPRHP will be necessary during any future phases of study.

5.3.1.h Inactive Hazardous Waste Sites

The Cayuga Creek watershed contains numerous inactive hazardous waste sites both known and suspected. The occurrence of any Hazardous Toxic Radioactive Waste (HTRW) site is viewed as a constraint to future project planning. Accordingly, a records search was conducted in order to identify any known or potential sites within or adjacent to the study focus area in the vicinity of the Cayuga Village Trailer Park.

Niagara County lies within the jurisdiction of the Region 9, NYSDEC. Region 9 encompasses a six county area that also includes the counties of Allegany, Cattaraugus, Chautauqua, Wyoming, and

Erie. The April 2001 NYSDEC Division of Environmental Remediation Annual *Report "Inactive Hazardous Waste Disposal Sites in New York State*" documents the location of 162 known inactive hazardous waste sites within Region 9 of which 56 sites are located within Niagara County.

Ownership of these sites consists of 42 private or industrial, 10 municipal, 3 New York State, and 1 Federal. Two of these sites were found within the study focus area. and other sites are located throughout the Cayuga Creek watershed

5.3.1.h.1 Study Focus Area Sites

The Dibacco Site No. 1 – Old Creek Site (DEC #932056A) is located behind 9115 Porter Road in the Town of Niagara, Niagara County, New York (see Figure 5). The fill of concern is located partially within the former creek channel of Cayuga Creek. The following chronology was gathered from documents contained in the NYSDEC files and obtained by the USACE through the Freedom of Information Act. The documentation includes reports prepared by Engineering Science, Dames & Moore, Ecology and Environment Engineering, P.C. and Malcolm Pirnie, Inc.

The subject portion of Cayuga Creek was re-routed circa 1969 in association with the construction of a flood control berm adjacent to the farmer's field. This local flood control effort left behind a 1500-foot-long section of former creek channel. In 1977, when the property was owned by Michigan Mayne Realty, dumping was allowed to take place within and adjacent to the former creek channel. This landfilling was short-lived due to a 1978 resolution by the town of Niagara, which banned further dumping at the site. The area was then graded and capped with clay.

During the landfill's short life span, Apex Salvage Company of Niagara Falls hauled various waste and demolition debris to the site from Carborundum Company, International Paper and Hooker Chemical. It appears that the vast majority of the waste consisted of demolition debris and damaged silica and aluminum products manufactured by Carborundum Company which were damaged in a warehouse fire. Additional wastes from Carborundum and International Paper included construction rubble, abrasive grains and alumina. Hooker Chemical records show that fly ash and spent hexachlorocyclopentadiene (c-56) catalyst of unknown quantities were dumped at the site. In all, it is estimated that 3,300 cubic yards of material was dumped.

Subsequent water samples of Cayuga Creek taken in the early 1980's showed low levels of lead, mercury and organic chemicals. During the 1990's, further sediment and groundwater sampling was performed under the direction of the NYSDEC to determine the need for remediation of the site. Soil borings taken during the installation of several monitoring wells indicated that there is between 0-4 feet of industrial & soil fill and fly ash over the original soil material. Soil analysis of all four borings contained some PAH contamination. Low concentrations of cyanide were found in one sample. Groundwater samples collected from the monitoring wells indicated the presence of lead, chromium, iron, magnesium, sodium, manganese and zinc above NYSDEC class 6A groundwater standards. Although no evidence of the c-56 catalyst from Hooker Chemical was identified during the 1992 Phase II investigation conducted by Ecology and Environment Engineering, P.C., additional samples taken by the NYSDEC in June 1992 and December 1993 found an area approximately five square feet in size with a concentration of 13 parts per billion (ppb).

A 1998 Malcolm Pirnie, Inc. report describes the results of additional soil samples taken in July of 1997. The samples, which were taken using the Toxic Characteristics Leaching Procedure (TCLP), indicated Volatile Organic Chemicals (VOCs), Semi-volatile Organic Chemicals (SVOCs), pesticides and herbicides were absent from the surface soils. No c-56 was detected at that time.

Although six of the eight TCLP metals were detected in groundwater samples, none exceeded EPA standards. Based on this information, the NYSDEC de-listed the site in 1998.

The Gibson site (NYSDEC #932063) is located to southwest of Cayuga Village Trailer Park near Tuscarora Road (see Figure 5). This site is still active. Remediation was performed in the late 1980's and included the re-alignment of 500' of Cayuga Creek and the containment of the waste. It is owned by Owen Corporation. There is a long-term Operation and Maintenance (O&M) plan in place.

Other sources of contaminants, known and unknown, are located within the watershed, including at least one PCB source within the Bergholtz Creek watershed. Contaminants have been found in Cayuga Creek at Lindbergh Avenue and are suspected to be associated with Love Canal. Contaminants were also found during recent fish studies at sampling points to the north of Porter Road in the vicinity of the Niagara Falls Air Force Base.

5.3.2 Expressed Watershed Problems and Needs

During the course of this study, the Buffalo District coordinated with state, county and other Federal agencies and the local watershed communities to identify flooding and other water resource problems and needs. Coordination was conducted with participants through office and field meetings, telephone meetings and written correspondence. Study participants, particularly the Niagara County Department of Planning, Development & Tourism, NYSDEC, the Town of Wheatfield, Town of Niagara, and the City of Niagara Falls, provided very useful data and information for this study.

The coordination process yielded the following non-flood related problems and needs (not in order of importance) expressed at both the local and watershed level. All participants acknowledged these problems and needs and expressed varying levels of support for the development of solutions.

A. Drainage and Infrastructure (maintenance and coordination).
B. Flood Protection.
C. Shoreline Stability, Erosion and Sedimentation.
D. Woody Debris and Refuse Accumulation.
E. Water Quality.
F. Contaminated Sediments.
G. Loss of Fish & Wildlife Habitat.
H. Loss & Degradation of Riparian Corridors.
I. Floodplain and Riparian Restoration and Protection.
J. Lack of Coordinated Watershed-Level Planning and Management.

Limited baseline data exists for the Cayuga Creek watershed that quantifies in detail the existing watershed conditions with regard to drainage and natural resources sufficient for purposes of watershed based land use planning and management. County officials, local communities and resource agencies recognize the need for more detailed comprehensive study of the watershed to yield this necessary data and information and have expressed their support for further comprehensive study. Watershed stakeholders understand that information gained from further study will facilitate efforts towards unified planning of watershed drainage and resource management and restoration and the development of solutions to the other expressed watershed problems and needs.

5.3.2.a Planning Objectives

The following planning objectives have been developed in response to the drainage and related water resource problems identified in Section 5.3.2. These objectives are set forth as a starting point for development of planning objectives for a detailed comprehensive study of the Cayuga Creek watershed.

Objective 1. Evaluate the drainage (hydrology and hydraulics) of the Cayuga Creek watershed to document and evaluate existing conditions. Data and information from this study would be used for unification of watershed drainage management, land use planning, and support water resources restoration project planning. Successful implementation of a comprehensive study will require the continued voluntary support of the entire watershed community.

Objective 2. Evaluate and document fish and wildlife habitat and shoreline conditions in the Cayuga Creek watershed and its tributaries. Identify specific opportunities to restore shoreline and aquatic and terrestrial habitat associated with wetlands and floodplains. Aquatic and terrestrial habitat associated with Cayuga Creek has been greatly reduced from its historic extent through development in the basin. Restoration and rehabilitation of natural wetlands and riparian shoreline functions could restore significant habitat elements.

Objective 3. As site specific project opportunities emerge to address problems and needs such as local shoreline stabilization, clearing and snagging, and ecosystem restoration, projects should be separably initiated under authorities such as the Corps' Section 14 and 206 programs (as well as those of other agencies and entities). Site-specific shoreline stabilization and habitat restoration projects will enhance the quantity and aesthetic quality of landscape and recreation opportunities in the short-term. The detailed watershed study is needed to formulate and realize systemic and landscape based long-term goals including restoration of the hydrologic regime and fluvial geomorphic function of Cayuga Creek and its tributaries to a condition resembling a more natural state. The longevity of all ecosystem restoration projects in the watershed is governed by how much they depend on these functions.

Objective 4. Develop an integrated comprehensive framework plan for Cayuga Creek management and restoration that assists in achieving the goals and objectives of state, county, other Federal agencies and the local watershed communities and stakeholders. The lack of a coordinated, basin-wide strategy for watershed drainage and management is presently a major constraint to implementation of cost-effective solutions to the identified watershed problems. A need exists for an agency or entity such as the Niagara County Department of Planning, Development and Tourism to take the lead role in development of a comprehensive, long-term framework plan for restoration of the Cayuga Creek watershed that integrates missions, authorities' programs, plans and projects of Federal and State agencies, local authorities, watershed councils, and other stakeholders. The Corps of Engineers has a long history in management and development of water resources in the region and has the technical and planning expertise to undertake a key role in the development of such a plan.

Objective 5. Develop the watershed management tools needed to identify cost effective, environmentally sensitive methods for reducing flood risks and flood damages through restoration of natural storage functions of the wetlands and floodplains. Restored, created, and preserved wetlands and floodplains would act to absorb excess flood waters, slow the velocity of flood waters, and create habitat for a wide variety of plants and animals, including fish species. Further understanding the physical functions of the Cayuga Creek system is required to clearly establish a watershed management strategy, identify specific projects, and facilitate informed decision-making in regard to the effects of existing and proposed development and within the watershed.

6.0 FEDERAL INTEREST

Flood control (i.e., flood damage reduction) on navigable waters or their tributaries is in the interest of the general public welfare and is therefore a proper activity of the Federal Government in cooperation with the states and local entities. The scope of the Federal interest includes consideration of all alternatives in controlling flood waters, reducing the susceptibility of property to flood damage, and relieving human and financial losses.

The principal purpose of this study was to determine if there is a Federal interest in developing a plan for flood damage reduction in the Town of Niagara in the vicinity of the Cayuga Village Trailer Park. The Buffalo District identified factors contributing to flooding, completed a preliminary survey of damages, and a cursory evaluation of the benefits and costs associated with two levels of alternative plans of protection. The results of these preliminary analyses identified sufficient damage-reduction benefits indicating a Federal interest in the formulation and evaluation of local structural and non-structural alternatives for flood control on Cayuga Creek in the Town of Niagara.

Based upon the specific geographic scope of the problem, and relatively limited amount of damages associated with flooding, the Buffalo District recommends that a feasibility study be undertaken through the Continuing Authorities Program, specifically the provisions of Section 205 of the Flood Control Act of 1948, as amended.

The results of this study also revealed the fundamental need for a comprehensive study of the watershed to develop a detailed baseline knowledge of watershed characteristics essential to facilitate unified watershed planning, management and the formulation of implementable plans to address watershed-level problems and needs. State, county, local communities and other Federal agencies recognize this need and have placed a high priority on understanding the drainage and water resources characteristics within the Cayuga Creek watershed.

The Corps of Engineers has the technical and planning expertise and capability to assist in the detailed study of the watershed and cooperative development of an integrated basin strategy. Such participation is consistent with Federal law, regulation and policy. Accordingly, the Buffalo District recommends that a comprehensive watershed scale study be undertaken through the provisions of the U.S. Army Corps of Engineers' Planning Assistance to States program. The Planning Assistance to States program provides the U.S. Army Corps of Engineers with the general authority to partner with any state, tribe or local government to study and prepare comprehensive plans for the development, utilization and conservation of water and related land resources of drainage basins including ecosystem planning.

7.0 PRELIMINARY FINANCIAL ANALYSIS

By law, the State of New York, through the New York State Department of Environmental Conservation, serves as the non-Federal sponsor for cost-shared flood control studies and projects. When a local entity requests a study through the Corps of Engineers, the NYSDEC becomes cooperatively involved with the local partner through the life of the project.

The NYSDEC, Town of Niagara, and other local stakeholders were presented with the findings of this study and the recommendation for a feasibility study through the Continuing Authorities Program, specifically the provisions of Section 205 of the Flood Control Act of 1948, as amended. Consequently, the local stakeholders declined to purse a feasibility study for flood control at this time. Rather, in response to strong local support for a comprehensive study of drainage and other water resource characteristics within the Cayuga Creek watershed, the Niagara County Department of Planning, Development and Tourism has expressed willingness to spearhead a detailed watershed study through the provisions of the Planning Assistance to States program.

Accordingly, further comprehensive study of the Cayuga Creek watershed will be pursued cooperatively with the Niagara County Department of Planning, Development and Tourism through the provisions of the U.S. Army Corps of Engineers' Planning Assistance to States program.

8.0 RECOMMENDATIONS

The findings of this study support the recommended termination of this Section 905(b) (WRDA 1986) Analysis.

Glen R. DeWillie

GLEN R. DEWILLIE
LTC, EN
Commanding

18 March 2002
Date

APPENDIX A

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